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Morphological Characters of Scotian Shelf Redfish (Sebastes spp.) and Rosefish (Helicolenus dactylopterus)

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February 1983

Canadian Manuscript Report of Fisheries and Aquatic Sciences No. 1707

35-2945/

Canadian Manuscript Report of Fisheries and Aquatic Sciences

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Morphological characters of Scotian Shelf redfish (*Sebastes* spp.) and rosefish (*Helicolenus dactylopterus*).

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Minister of Supply and Services Canada 1983

Cat. No. Fs 97-4/1707 ISSN 0701-7618

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ABSTRACT

Kenchington, T.J. (1983). Morphological Characters of Scotian Shelf redfish (*Sebastes* spp.) and rosefish (*Helicolenus dactylopterus*). Can. MS Rep. Fish. Aquat. Sci. 1707; iv+65 p.

Data were gathered on a large number of morphometric, meristic and other morphological characters of 876 Sebastinid fish (*Sebastes fasciatus*, *S. mentella* and *Helicolenus dactylopterus*) from the Scotian Shelf. Those data are presented here with full details of the methods used, plots and summary statistics for each character and a discussion of the suitability of each character for use in multivariate studies. Data are appended on a further 30 fish, for which specific electrophoretic identifications are available.

Key Words: redfish, *Sebastes fasciatus*, *Sebastes mentella*, *Helicolenus dactylopterus*, morphometrics, meristics

RÉSUMÉ

Kenchington, T.J. (1983). Morphological Characaters of Scotian Shelf redfish (*Sebastes* spp.) and rosefish (*Helicolenus dactylopterus*). Can. MS Rep. Fish. Aquat. Sci. 1707; iv+65 p.

Des données ont été recueillies sur un grand nombre de caractères morphométriques, méristiques et autres caractères morphologiques de 876 poissons sébastinides (*Sebastes fasciatus*, *S. mentella* et *Helicolenus dactylopterus*) du plateau Scotian. Le présent rapport contient ces données, ainsi que les détails des méthodes utilisées, les diagrammes et les résumés statistiques de chaque caractère. Il contient également une analyse de la manière dont chaque caractère peut convenir à des études multidimensionnelles. A ceci s'ajoutent des données sur 30 autres poissons pour lesquels existent des identifications électrophorétiques spécifiques.

INTRODUCTION

The redfishes (Sebastes spp.) of the Scotian Shelf are presently managed as a single unit. However, a number of recent studies have suggested that three species of this genus occur in the northwest Atlantic: Sebastes fasciatus, S. marinus and S. mentella (Barsukov, 1968, 1972; Barsukov and Zakharov, 1972; Ni 1981a, 1981d). The arrangement of "stocks" within these species is almost entirely unknown. In addition, blackbelly rosefish (Helicolenus dactylopterus) occur on the Scotian Shelf. While they are too small to enter the commercial catches, they are taken in research vessel surveys and are sometimes confused with juvenile Sebastes.

It is therefore necessary to determine whether the three redfish species are distinct; what characters can be used to identify these three and the rosefish in the field; where each species occurs on the Scotian Shelf; and what intra-specific population structures (if any) are present. Two distinct, but interrelated, approaches to these problems have been attempted. The first involved the collection of a large file of morphological data on Scotian Shelf redfishes and rosefish. These data have been used in several multivariate analyses which will be published elsewhere. This report, in addition to the raw data and summary statistics, presents details of the methods used in gathering the data and a discussion of each character examined.

The second approach involved an electrophoretic study of a small number of fish. Extrapolation of the results of that study to the population as a whole, and comparison of them to earlier work, is dependent on the morphological characteristics of the fish identified electrophoreticly. Similar morphometric data to those in the main data file were, therefore, gathered for these fish. Those data are presented in this report, but they have been excluded from most of the summaries and discussion because of the selective collection of these samples.

Preliminary analyses of parts of the main data file have been presented by Kenchington (1980, 1982). The electrophoretic study has been published by McGlade et al. (in prep.).

METHODS

SAMPLE COLLECTION

Samples of redfishes (Sebastes spp.) and blackbelly rosefish (Helicolenus dactylopterus) were collected from bottom-trawl catches on various cruises of the A.T. Cameron, E.E. Prince, and Lady Hammond (Table 1). On most of these cruises, redfish sampling was an accessory task. In these cases, the cruise personnel were asked to collect 20 to 25 redfish from every set in which sufficient individuals were left after routine otolith sampling. These samples were, in fact, only collected from a few such sets. The fish were on deck for an extended period before being frozen.

On those cruises which were primarily designed for redfish studies (P247, H030) all redfish (to a maximum of 25 per set) were gathered. These were rapidly frozen.

Finally, four redfish were collected from the bycatch of an inshore fisherman working in St. Margarets Bay, Nova Scotia. These four were the only representatives in the study of those redfish which occur in shallow, inshore waters along this part of the Nova Scotian coast.

The resulting collection had a preponderance of samples from the western half of the Scotian Shelf, although there were some from as far east as the Laurentian Channel. Thus, these fish are not a random sample of those on the Scotian Shelf and analyses of the data cannot strictly be directly applied to that larger population. However, the collection did cover most of the range of redfish on the Shelf and the data are probably not greatly different from those which a truly random sampling scheme would have produced. Certainly, no conscious selection of particular forms of Sebastes was made and comparisons of types within that genus, as they occur on the Scotian Shelf, should not be affected by any biases caused by the sampling methods.

All the samples were held frozen for a period of days or months until processed (except for the St. Margarets Bay fish, which were processed fresh). However, the freezing units failed on some occasions, causing some of the fish to go through one or more freeze-thaw cycles. This may have had some effect on the final morphometric measurements.

The 30 fish used in the electrophoretic study were taken during cruise H076. Ni (1981a,c) found that anal fin ray count was a comparatively good separator of Sebastes fasciatus and S. mentella, with the former usually having 6 to 8 rays and the latter 8 to 10. Thus, 10 fish were selected with 6 or 7 anal rays, 10 more with 9 or 10 and a final 10 (as "unknowns") with 8 anal rays. Other species (S. marinus and Helicolenus dactylopterus) were deliberately avoided during this collections, but no other selection was made. Tissue samples were taken for electrophoresis from the fish and both tissue and fish were then rapidly frozen and returned to the laboratory. The tissue samples were then stored at -40°C.

LABORATORY METHODS

All the fish were processed, except that a few were discarded from the largest samples. In such cases, the last fish to thaw were not processed. This discarding did not involve any conscious selection of particular body forms.

A variety of characters were then determined for each fish. These were selected from those which have been suggested as separators of the genera Sebastes and Helicolenus (Bigelow and Schroeder, 1953; Leim and Scott, 1966), those which have been suggested as separators of the three redfish species (Templeman, 1959; Barsukov, 1968, 1972; Barsukov and Zakharov, 1972; Ni, 1981a,d), those which appear to vary regionally in northwest Atlantic redfishes (Kelly et al., 1961), and a few, such as weight and total length, which are of fishery-management interest.

The characters examined varied somewhat

between samples as preliminary analyses indicated that some had no value for the purposes of the study, while additional ones were found to be useful by other workers and were incorporated here. Some characters were unavailable for certain fish, due to various types of damage.

Weight

The weight of each fish was recorded to the nearest gram in most cases. Because of the condition of both balance and fish, it was only accurate to the nearest 10g at best.

Morphometrics

All morphometric characters were measured to the nearest millimetre. (A few replicate measurements suggest that they are accurate to about ± 2mm.) Total, fork and standard lengths were measured on a measuring board. The others were taken off the fish using dividers. The characters examined are shown in figure 1. They were:

Total Length: From tip of schnabel with mouth closed, to tip of longest caudal fin ray extended posteriorly.

Fork Length: From tip of schnabel with mouth closed, to tip of shortest caudal fin ray extended posteriorly.

Standard Length: From tip of schnabel with mouth closed, to end of vertebral column (estimated by flexure of caudal fin and by position of most posterior scales).

Snout-Ventral Fin: From midline of upper jaw to origin of ventral fin on left side.

Snout-Anal Fin: From midline of upper jaw to origin of anal fin.

Maximum Body Depth: Maximum depth of body, measured perpendicular to axis of body length.

Body Depth (dorsal to ventral fin origins): Distance from origin of dorsal fin to origin of ventral fin on the left side.

Caudal Peduncle Depth: Minimum depth of caudal peduncle measured perpendicular to axis of body length.

Head Length: From midline of upper jaw, to tip of opercular spine on the left side.

Snout Length: From midline of upper jaw, to most anterior point on the periphery of the left orbit.

Schnabel Length: From tip of schnabel, to top of lower jaw teeth on the midline.

Orbit Width: Diameter of left orbit on axis of body length.

Orbit Height: Diameter of left orbit on axis perpendicular to body length.

Interorbital Distance: Minimum distance between peripheries of left and right orbits.

Length of Longest Dorsal Spine: From surface of body to tip of spine, for the longest spine in the dorsal fin.

Some of the morphometric characters of the electrophoretic sample were measured after the fish had been fixed in formalin and stored in alcohol. The standard lengths of these fish were re-measured at this time, and had decreased by an average of 2.5mm. This is about 1% of standard length. Since the other measurements taken were mostly less than 100mm and were from the heads (which should shrink less than the body), this shrinkage was ignored.

Other Shape Characters

The following were recorded in qualitative terms:

Head Contour: The shape of the head, from upper jaw to the highest point of the body, when viewed from the side.

Angle at Dorsal Fin Origin: Presence or absence of a distinct angle in the head contour, rather than a gradual curve, at the origin of the dorsal fin.

Topmost Spine: Dorsal fin spine at the highest point on the fish's body, counted from the anterior end of the fin.

The distinctive head shape of Helicolenus was noted, but not recorded.

Meristic Characters

Dorsal Fin Spines: Total number of spines in dorsal fin.

Dorsal fin rays: Number of soft rays in dorsal fin. (Initially all rays were counted, but for 284 fish both the total count and the count excluding the posterior half element were recorded. In only one of these (Cruise H030, set 32, fish 1) was the half element missing. The earlier counts were therefore reduced by one, and the counts for all fish represent the number of rays excluding the half element, with a small number perhaps having the wrong count.)

Anal Fin Spines: Total number of spines in the anal fin.

Anal Fin Rays: Number of soft rays in the anal fin. (Treated as dorsal fin rays, except that both counts were taken on 326 fish and none lacked the half element.)

Pectoral Fin Rays: Total number of rays in left pectoral fin. The presence or

absence of free rays in the pectoral fin was recorded for many fish.

Ventral Fin Spines: Total number of spines in the left ventral fin.

Ventral Fin Rays: Total number of soft rays in the left ventral fin.

Vertebrae: Number of vertebrae, excluding the basioccipital and urostylar half vertebra. These were counted on radiographs.

Upper Gill Rakers: Number of gill rakers on upper limb of the first gill arch on the left side.

Lower Gill Rakers: Number of gill rakers on lower limb of the first gill arch on the left side.

For the electrophoresis sample, the gill rakers were counted with the gill still in the fish (so as not to damage the specimens excessively). The upper gill raker count may have an error (± 1) because of the difficulty of counting in this way.

Head Spine Characters

The angles of the uppermost, middle and lowest preopercular spines were assessed visually. Upwards was designated 0°, posterior was 90°, downwards 180° and anterior 270°. These angles were determined to the nearest 10°.

The presence or absence (on left, right or both sides) of the pre-occipital, supra-occipital, post-occipital, tympanic, coronal and parietal spines was noted (using the spine nomenclature of Phillips, 1957). The fusion of the parietal-nuchal ridges was also recorded (separately for left and right sides, using the technique described by Barsukov (1972): the ridge was considered to be fused if no separate parietal spine could be felt with a dissecting needle. When the ridge was fused, the spine at its end was considered to be the parietal (cf. Barsukov (1972), but he used the term "occipital spine" for what is here called the parietal.)

Extrinsic Gasbladder Muscles

Hallacher's (1974) method for determining the route of these muscles was found to be too slow for routine use. An attempt was made to determine the same character by dissection from within the body cavity. This was much quicker, but less accurate. The tendons passing immediately posterior to each of ventral ribs 2, 3, and 4 were recorded as "major" (one or more tendons; at least one large), "minor" (one or more tendons; all small) or "none". This corresponds to Ni's (1981d) terminology for these muscles.

For the 30 fish in the electrophoretic sample, Hallacher's (1974) method was used, except that only sufficient dissection was made to determine the route taken by these muscles through the ventral ribs.

The left muscles were usually examined, with the right ones used as a check or in case the left ones were damaged. Both Hallacher (1974) and Ni (1981d) found perfect symmetry in this character in the fish they examined.

Colour

Notes were kept of external colour patterns. These have been suggested as an identifier of the species of Sebastes (Litvinenko 1974). The colour of the peritoneal lining of the body wall (which is sometimes used as a generic character; Bigelow and Schroeder, 1953) was recorded on a four point scale; silver, silver-grey, dark-grey and black. These were, of course, subjective divisons.

Sex

The sex was determined by inspection of the gonads.

Other Information

Notes were maintained of visible parasites, but no detailed search was made for them. Ovaries, stomachs, and otoliths were collected whenever possible. No study has yet been made of these latter three, and they are not dealt with further in this report.

The fish were not preserved after processing, with the exception of the electrophoretic sample. These 30 fish are available for further study.

IDENTIFICATION OF THE FISH

When the collection of these data began, it was not clear whether Sebastes fasciatus and S. mentella were distinct species, and reliable techniques for their identification were not available. Some recommended methods for separating Sebastes and Helicolenus also seemed to be uncertain. Therefore, no attempt was made to assign names to the fish when they were processed.

After the data were collected, it became clear that the only bimodal characters, amongst those examined, in which the modes comprised non-overlapping domains were vertebral and lower gill raker counts (see below). Dorsal fin spine and anal fin ray counts were biomodal (see below) but the modes overlapped. A comparison of these characters with the key published by Bigelow and Schroeder (1953) suggested the following:

1) Fish with 12 or less dorsal fin spines, or 25 or less vertebrae or 5 or less anal fin rays were Helicolenus

2) Fish with 14 or more dorsal fin spines, or 28 or more vertebrae or 7 or more anal fin rays were Sebastes.

Only two fish could not be readily identified by this key. One (fish 13, set 59, cruise H026) had only 12 dorsal fin spines, but 8 anal fin rays, 30 vertebrae, and a silver-grey peritoneum. It was identified as Sebastes. The other (fish 1, set 63, cruise H020) had 13 dorsal fin spines and 6 anal fin rays. No vertebral count or

peritoneal colour was recorded. It was therefore noted as of "unknown" genus, though its lack of free pectoral rays suggests that it was Sebastes.

Within Sebastes, Ni's (1981a) results suggest that fish with 28 or 29 vertebrae or 6 or 7 anal fin rays are S. fasciatus, while those with 31 vertebrae or 9 or 10 anal fin rays are almost all S. mentella. These fish were identified as such. A large number of fish with 30 vertebrae and 8 anal fin rays could be either species, and were designated "Sebastes spp."

The fish in the electrophoretic sample were identified by extrinsic gasbladder muscle route, using Ni's (1981d) criteria, and by electrophoresis (McGlade et al., in prep.). These techniques were in full agreement with each other.

COMPUTING METHODS

Most of the data were combined into a computer file. This was edited both by direct examination and by identifying anomalous results in various analyses. The electrophoretic sample data were formed into a separate file. They are excluded from the discussion that follows (except as concerns their head spines and gasbladder muscles). Characters that were only measured on a few fish were not added to the computer files, but are discussed below.

Plots and summary statistics for the characters on the main computer file were calculated using the "Scattergram" and "Frequencies" subprograms of the Statistical Package for the Social Sciences, Version 8·0 (Nie et al., 1975). The morphometric measurements were strongly dependent on the length of the fish. To remove this size effect, each character was regressed against standard length (a predictive regression, using the "Scattergram" subprogram of SPSS). From the regression equation, residuals were calculated for each fish (Residual = Measured value - Predicted value) and the distribution of these was examined using the "Condescriptive" and "Regression" subprograms of SPSS. This method of removing the size effect would not be adequate for many multivariate analyses, but is sufficient for the present study of raw data distributions.

RESULTS AND DISCUSSION

The data file forms appendix 1 of this report. Appendix 2 contains the data on the sample of fish used for electrophoresis. Computer tapes of these data, in a suitable format for statistical analysis, have been deposited with the EDP Coordinator of Marine Fish Division.

WEIGHT

The length-weight relationship is illustrated in figure 2. A predictive linear regression on the logarithms of these data produced the relationship:

$$W = \cdot 026339\ L^{2 \cdot 9944}$$

for weights in grams and standard lengths in centimetres. From the relationship between fork and standard lengths given below, the first coefficient would be approximately ·023 for fork length. This compares with the relationship:

$$W = \cdot 0188\ L^{2 \cdot 962}$$

which Clay and Clay (1980) determined from data on 1453 Scotian Shelf redfish. The difference is very considerable, the relationship derived here giving a weight of 353g for a 25cm (fork length) fish, while Clay and Clay's (1980) one gives 260g. This difference does not seem to be due to random variability in the data, since the correlations were very strong in both cases (present data, $r^2 = \cdot 9824$; Clay and Clay (1980), $r^2 = \cdot 968$) and both data sets are large. No explanation of the difference can be proven, although the presence of deep-dwelling fish (including S. mentella) and of Helicolenus in the present data set will have some effect, as will the concentration of sets in the western part of the Shelf. (Clay and Clay's (1980) samples came from stratified random surveys of the entire Shelf.) The present samples included some ripe and running fish, while Clay and Clay (1980) would have had mostly spent ones (collected in July). All of these factors will probably have had some effect.

MORPHOMETRICS

The relationships of the major morphometric characters to standard length are shown in table 2 and figure 3. The distributions of their residuals are summarized in table 3 and the correlations between these are given in table 4. For every character shown in table 2, the correlations and slopes are significant at P ·0001. The intercepts, however, are of more variable significance.

It is clear from the figure and tables that each of these characters is linearly related to standard length (and hence to each other) with the exception of the length of the longest dorsal spine. This linearity holds over the range of the data (standard lengths 75mm to 375mm). Furthermore, the small or non-significant intercepts show that growth is approximately isometric, except for the snout-ventral fin distance. These relationships have remarkably small variability, the variances indicating that 95% of the fish are within a few millimetres of the shape predicted by the regressions. None of these characters have perfectly Normally distributed residuals, however most have only slight skew. They are all leptokurtic, but not severely so.

Although the growth of each of these characters is a continuous process, they were only measured to 1mm accuracy. For some of them (e.g. interorbital distance, schnabel length), the measurements are small and so they can only take a few possible values. For these characters, the data have discrete distributions, despite the continuous nature of the biological character that was measured.

None of the residuals are independent of the others. Of the 78 correlation coefficients in table 4, 34 are significant at P<·01. All of these signficiant correlations are positive, which suggests that standard length is a poor estimator of overall size: fish which are relatively short tend to have positive residuals

on other morphometric characters, and vice versa.

Thus, apart from the longest dorsal spine length, these characters approximate to linearity and Normality (but in some cases not continuousness) over the range of sizes for which data are available. As a group, they are not multivariate Normally distributed, but they might approximate to that if size were compensated for in another way.

Figure 3 suggests that the longest dorsal spine character shows allometric growth. However, it has be suggested (Litvinenko, 1974) that these spines are relatively shorter in Sebastes mentella than in S. fasciatus, and the apparent curvature might therefore be caused by the presence of a few large S. mentella amidst many S. fasciatus. Figure 4 shows the same relationship for only those fish that were identified as S. fasciatus on the basis of their meristic counts. The curvilinearity is less evident, but still present. Therefore, the dorsal fin spines of Sebastes fasciatus undergo allometric growth. Their length should not be used in multivariate morphometric studies unless this allometry is compensated for.

The maximum body depth is not included in the tables or figures. It was measured in 132 fish and was almost invariably identical (to the nearest millimetre) to the depth measured between dorsal and ventral fin origins. The latter is easier to measure (because of its better-defined end points), is less affected by distortions of the soft body wall and is a homologous character (sensu Bookstein, 1978). Maximum depth was therefore abandoned and is not recommended for future studies.

Orbit width and the snouth-ventral fin distance did not contribute greatly to discrimination between Sebastes fasciatus and S. mentella in a preliminary analysis (Kenchington, 1980) and were therefore not recorded for the later fish processed.

The schnabel length measurement used here was that used by Kelly et al. (1961). It includes the thickness of the lower jaws and the height of the teeth, as well as the schnabel length itself. Thus, a fish with no recognizable schnabel has a finite schnabel length measurement (e.g. fish 1, set 54, cruise HO27 which had a schnabel length of 3mm) and fish with thick jaws or high teeth have inflated schnabel lengths. A different measurement should be used in future studies.

OTHER SHAPE CHARACTERS

Barsukov (1968) suggested that Sebastes fasciatus and S. mentella could be distinguished by their head shape. He later (Barsukov and Zakharov, 1972) withdrew this suggestion. In the present study, the shape was recorded for 118 fish (cruise HO30, sets 10, 11, 17, 18, 22, 25, 30, 32, 34, 37, 50, 54), 115 of which were identified as S. fasciatus by their meristic characters, while 3 where identified as Sebastes spp. The head contour was difficult to evaluate, and changed greatly depending on whether the mouth was open or closed and on the flexure of the neck. The great majority (83 fish) were recorded as having straight "foreheads", but 27 had concave ones and 8 had convex ones. Most of these fish had a distinct angle in the head shape at the origin of the dorsal fin, but 7 did not have one and it was doubtful in others. The topmost spine varied from the first to the eighth, and several fish had horizontal backs over the distance between these spines. This character was critically dependendent on precisely what axis was defined as horizontal (a point not discussed by Barsukov, 1968).

Thus, while average members of the two species may differ in head shape as Barsukov (1968) suggested, these characters are too variable to be used alone for identification and cannot readily be coded for use in multivariate studies. The present results support Barsukov and Zakharov's (1972) conclusion that this character has no value.

Although not recorded during the sample processing, it became clear that the best character for the visual separation of Helicolenus from Sebastes is the head shape. The differences are subtle and cannot confirm an identification, but they do allow the rapid sorting of hundreds of fish after only a little practise. Figure 5 illustrates these differences.

MERISTIC CHARACTERS

The distributions of the meristic characters are shown in figure 6 and summarized in table 5. All of these distributions are left skewed. This skew is very strong in some cases. However, much of this is due to the presence of Helicolenus in the data set, with its generally lower meristic counts. Ni's (1981b,c) results suggest that Sebastes has right skewed distributions of vertebral and anal fin ray counts at least. All of the distributions are leptokurtic (strongly so in some cases), though once again this is affected by the presence of three species in the data set.

These skews and kurtoses, with the discrete distributions that are inevitable for meristic characters, make these data unsuitable for many conventional multivariate analyses. They should only be used in analyses that are robust to such deviations from Normality.

In addition to the gill rakers recorded in table 5 and the appendices, every fish examined had one on the angle between the upper and lower limbs. The total raker count would, therefore, be one more than the sum of the upper and lower counts.

The anal fin spine, ventral fin spine and ventral fin ray counts are excluded from table 5 and the appendices. They were counted in each of 132 fish and were invariably 3, 1, and 5 respectively. These counts are non-varying characteristics of the Scorpaenidae (Phillips, 1957).

The presence of free rays in the pectoral fin is a distinguishing feature of Helicolenus (Bigelow and Schroeder, 1953). Of the 125 fish for which this character was recorded, 2 Sebastes

were noted as having free rays, while 1 Helicolenus was noted as lacking them. These are probably mistakes due to the inability of inexperienced recorders, when working quickly, to distinguish between torn fin membranes and genuinely free rays. This is not an ideal character for general use, but it is probably an accurate identifier of the genera for experienced workers.

Four abnormalities of meristic characters were noticed. Fish 3 of set 58, cruise H027 had a deformed dorsal fin. It was normal from the 1st to the 9th spine, but the 10th and 11th spines were short and the fin membrane followed them; descending, turning towards the left side of the fish and inserting there. The 12th spine began an entirely separate fin which had no further abnormalities.

Three fish had complex vertebrae. Fish 19, set 25, cruise H037 and fish 13, set 28, cruise H037 had additional spines between their posterior vertebrae. Fish 5, set 24, cruise H073 had its 22nd and 23rd vertebrae fused.

HEAD SPINES

The distributions of the preopercular spine angles are shown in Figure 7 and Table 6. Not only do these spines have a very wide range of angles, but a very small change in the form of the spine can result in a very large change in the angle recorded. This was a particular problem with the lowest spine. (Figure 8 illustrates some of the forms this spine could take. It is a hypothetical diagram designed to show how minor changes in bone growth can alter the angle recorded.) For these reasons, preopercular spine angles are not reliable characters. They are not recommended for future use.

Table 6 also summarizes the presence and absence data for the other head spines. Unfortunately, of the 284 fish for which these characters were recorded, 280 were identified as Sebastes fasciatus and the remainder (identified as Sebastes spp.) were probably S. fasciatus. Thus, these data cannot be used in a comparison of the species. (The data for the electrophoretic sample (Appendix 2) suggest that the head spination of S. mentella is similar to that of S. fasciatus except that the preoccipital, supra-occipital, post-occipital, and tympanic spines are slightly more likely to be missing. Although not quantifiable, the head spines of S. mentella seem to be less well developed, on the average, than those of S. fasciatus.) These characters have the distributional problems common to all presence-absence data and so must be analysed by techniques appropriate to that form.

Five fish had abnormalities of their head spines. Fish 6 of set 41 and fish 15 of set 57, both of cruise H026, had bifurcated middle preopercular spines. Fish 23 of set 26, cruise H026, had a bifurcated opercular spine. Fish 5 and 8 of set 10, cruise H030, had nuchal spines entirely separate from the parietal ones; that is, they arose separately from the head and were not extensions of the parietal ridge. This latter abnormality was also noticed by Barsukov and Zakharov (1972) in some of the fish they examined.

EXTRINSIC GASBLADDER MUSCLES

These muscles were examined in 197 fish, 186 of which were identified as Sebastes fasciatus, while the remainder were Sebastes spp. The results cannot, therefore, compare the muscles of S. fasciatus with those of S. mentella. They may be useful in examining this character within S. fasciatus. Ni (1981d) found that this species never has a major tendon passing immediately posterior to the second ventral rib. In the data presented here (table 7), however, 11 of the 197 fish are recorded as having a major tendon following this route. Whether these 11 fish show that the extrinsic gasbladder muscle route is more variable than Ni (1981d) suggested, or whether the dissection method used here involves about 5% error, is uncertain. The latter is quite probable. In either case, this dissection method cannot be used for accurate field identification of the two speices. Hallacher's (1974) method, which Ni (1981d) used, is too slow for field use.

(Because the extrinsic gasbladder muscles of fish in the electrophoretic sample were examined using Hallacher's (1974) method, extra details on them are available. These are listed in Table 8. They agree with the general pattern of Ni's (1981d) results, in that no Sebastes fasciatus had a major tendon passing anterior to the third ventral rib, nor did any S. mentella have one passing posterior to this. However, the minor tendons are different to Ni's findings, with some combinations that he did not find and different relative abundances of those that are common to both data sets. The present samples are very small, but they do suggest that this character is potentially of use in identification, but that it should be investigated in a wider range of Sebastes samples before being used. Identifications of the species using this character were in full agreement with those based on electrophoresis.)

COLOUR

Many of the fish had faded too much for records of their colour to be useful. (Personal observation suggests that this fading occurs when the fish die while still in the net.) In general, the Sebastes appear to have conformed to Bigelow and Schroeder's (1953) description; red with a dusky blotch on each operculum and several irregular dusky patches along the back. These dorsal marks were more distinct in smaller fish, but were clear in some as large as 180mm standard length.

Litvinenko (1974) suggested that the shape of the most posterior dorsal mark could be used to separate juvenile Sebastes fasciatus and S. mentella. The shape of this mark could be discerned in 12 of the fish included in the present study. None of the 12 conformed closely to Litvinenko's (1974) descriptions, but they were much larger fish than he studied and had probably lost much of their juvenile pattern.

The Helicolenus lacked dorsal dark marks, but did have dark opercula. Some (but not all)

had small dark marks around the posterior margins of the scales and on the dorsal fin. These are the "dusky vemiculations" mentionned by Bigelow and Schroeder (1953). Those fish that lacked this feature may have lost it when damaged in the net.

Peritoneal colour was recorded as "black" for 60 fish, "dark grey" for 148, "silver grey" for 293 and "silver" for 25. Of those fish which were identified as Helicolenus, 19 had black peritonea and none were recorded as having any other colour. Thus, Bigelow and Schroeder (1953) were correct in stating that this species has a black peritoneum. However, 41 of 526 Sebastes also had black peritonea, so this is not a useful field character for separating the genera.

Amongst the Sebastes, the largest fish with a black peritoneum was 202mm standard length, while the smallest with a silver one was 209mm. This is some indication that the peritonea become lighter with increasing age.

PARASITES AND DISEASE

No parasites or other evidence of disease were observed in the great majority of the fish, though only prominent ones would have been seen during the superficial examinations made. There were 11 exceptions: Fish 4 of set 58, cruise HO27, had a dark swelling some 40mm by 20mm, and 10mm high, near the spinous portion of the dorsal fin on the left side. When dissected, this proved to be a fibrous body, extending inwards to the pterygiophores, with sharply defined edges. Similar, but usually smaller, traces were seen on fish 8 and 10 from the same set; fish 7, 8, 9, and 17 of set 54, cruise HO27; fish 2 of set 3, cruise HO30; and fish 3 of set 28, cruise HO37.

These bodies may correspond to the "tumours" mentionned by Templeman and Squires (1960) on which the parasitic copepod Sphyrion lumpi tends to settle. The "tumours" do not seem to be caused by the parasite (Templeman and Squires, 1960). However, with the exception of fish 2 of set 3, cruise HO30, all of these affected fish were caught in the Fundian Channel. The Gulf of Maine is known to be a centre of infestation of Sphyrion (Templeman and Squires, 1960) while this parasite is almost unknown from the Scotian Shelf. Thus, some relationship between Sphyrion and the "tumours" may be indicated.

The only direct evidence of the presence of Sphyrion was what appeared to be the dead head of one of these parasites in the flesh of fish 17 of set 28, cruise HO37. This was found on the left side of the body, very near to the insertion of the soft portion of the dorsal fin. In the samples reviewed by Templeman and Squires (1960), 1·5 to 5·8% of the Sphyrion occured in this part of the redfish's body.

The final abnormality was in fish 3 of set 53, cruise HO26. This individual had a large ball (about 130g weight) in its swimbladder, which seemed to be composed of blood and other fluids.

SUMMARY

From the discussions above, the characters which seem to be suitable for use in multivariate studies of redfish morphology are the morphometrics listed in table 2 (with the exception of the length of the longest dorsal spine) and the meristics listed in table 5 (provided that the analytical techniques are appropriate for their discrete, skewed and leptokurtic distributions). Other characters might be suitable if appropriately measured and analysed, but, with the techniques used here or the absence of data for certain fish, they are not usable. These include the extrinsic gasbladder muscle character.

Any attempt to analyse these data will be made more difficult by the very small variances. Even with three species in two genera in the data set, there is remarkably little variance in the morphometric residuals.

ACKNOWLEDGEMENTS

I would like to thank Odelia Maessen, Maryanne Frame and Dianne Beanlands for helping me process the earlier samples; Chris Voigt for counting all the gill rakers; Bill Dougherty (St. Andrews Marine Biolgical Station), Joe Arab (Halifax Dockyard, Dept. of National Defence), Dr. James Love (Dalhousie University), Dr. Jacqueline McGlade, and Dianne Beanlands for helping with the radiographs; Brian Leverman for helping with the production of the appendices; Art Cosgrove and Christopher Cody for drafting assistance; Brian Beck and the captains, crews, and scientific staffs of the A.T. Cameron, E.E. Prince, and Lady Hammond for their assistance in collecting the samples; Dr. Douglas Clay for his supervision during the early part of this study; Ellen Rice and Chris Annand for their critical reviews; Valerie Myra for typing the manuscript; and Drs. R. Halliday and T.D. Iles for permitting me to work with their Division. The author is a graduate student at Dalhousie University and was supported by an Isaac Walton Killam Memorial Scholarship.

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Table 1: Positions and depths of sets.

Cruise	Set	Latitude	Longitude	Depth (fm)	Date
A292	83	44°19'	63°01'	82	July 1979
P247	2	44°29'	61°25'	75	Dec 1980
H014	16	44°35'	57°13'	129	Mar 1979
	61	44°09'	62°28'	83	
H020	2	44°09'	63°32'	77	July 1979
	3	43°45'	62°56'	140	
	4	43°38'	62°54'	120	
	5	43°39'	63°36'	123	
	6	43°28'	63°39'	110	
	57	42°49'	63°39'	117	
	58	42°56'	63°34'	88	
	63	43°05'	61°56'	60	
H021	64	44°01'	62°51'	139	July 1979
	65	43°52'	62°55'	145	
	66	43°33'	63°07'	128	
	68	42°54'	62°02'	340	
	72	42°58'	61°55'	157	
	74	42°56'	62°07'	205	
	75	42°54'	62°15'	295	
H026	12	43°15'	60°55'	193	Oct 1979
	15	43°23'	60°08'	158	
	26	44°50'	59°28'	132	
	41	44°39'	58°38'	52	
	55	45°32'	57°55'	141	
	57	45°41'	57°58'	170	
	59	46°04'	58°25'	194	
H027	34	42°49'	63°22'	192	Oct-Nov
	54	42°23'	66°53'	192	1979
	58	42°41'	67°05'	148	
	61	43°29'	67°12'	118	
	64	43°58'	67°11'	78	
H030	3	44°88'	63°36'	101	Jan 1980
	4	43°57'	63°43'	102	
	10	43°34'	64°24'	84	
	11	43°38'	64°28'	87	
	12	43°37'	64°37'	77	
	17	43°17'	64°53'	75	
	18	43°11'	65°04'	95	
	19	43°17'	65°08'	87	
	22	43°16'	64°33'	81	
	26	43°11'	64°21'	59	
	30	43°15'	64°34'	79	
	32	43°13'	64°17'	61	
	34	43°24'	64°28'	75	
	36	43°34'	64°23'	91	
	37	43°34'	64°28'	85	
	50	43°27'	63°53'	80	
	54	44°02'	62°50'	138	
	60	44°28'	63°19'	58	

Table 1: (Cont'd)

Cruise	Set	Latitude	Longitude	Depth (fm)	Date
H037	2	43°43'	64°26'	82	July 1980
	5	43°04'	65°17'	72	
	25	42°57'	66°54'	95	
	28	42°21'	67°07'	172	
	39	42°40'	64°16'	157	
	41	42°49'	63°36'	132	
	42	42°50'	62°51'	129	
	56	44°05'	63°13'	99	
H073	2	43°30'	59°52'	282	Mar 1982
	6	43°46'	58°60'	275	
	11	44°10'	59°26'	103	
	20	44°13'	59°05'	133	
	24	43°59'	58°31'	220	
St. Margarets Bay		44°30'	64°00'	40 (Approx.)	Nov 1979

Table 2. Relationships of morphometric characters with standard length.

Character	r^2	Slope	Intercept	Standard Error of Slope	Standard Error of Intercept	n
Total Length	.9974	1.1940	0.9923**	.0029	.7090	448
Fork Length	.9960	1.1449	3.7062**	.0027	.6542	707
Snout-Ventral Fin	.9580	0.3678	5.1381	.0033	.7970	548
Snout-Anal Fin	.9877	0.6699	1.4292*	.0026	.6176	833
Body Depth	.9582	0.3656	-2.2517	.0027	.6310	832
Caudal Peduncle Depth	.9023	0.0800	1.8149	.0009	.2177	832
Head Length	.9781	0.3536	0.2433	.0018	.4383	828
Snout Length	.9247	0.0771	1.4622	.0011	.2625	831
Schnabel Length	.9035	0.0465	-2.1198	.0005	.1261	822
Orbit Width	.9055	0.1070	1.7377	.0015	.3582	548
Orbit Height	.9065	0.1038	1.5168	.0012	.2754	832
Interorbital Distance	.8947	0.0716	-0.2711**	.0009	.2038	826
Longest Dorsal Spine	.7911	0.0746	11.8159	.0017	.4353	487

* Not Significant at P = .01
** Not significant at P = .05

Table 3. Distributions of morphometric residuals.

Character	Variance	Skewness	Kurtosis	n
Total Length Residual	16.58	.09	2.57	448
Fork Length Residual	19.04	.20	3.79	707
Snout-Ventral Fin Residual	28.19	.39	1.36	548
Snout-Anal Fin Residual	21.58	.10	0.57	833
Body Depth Residual	22.49	-.11	1.73	832
Caudal Peduncle Depth Residual	2.67	.06	1.36	832
Head Length Residual	10.72	-.10	0.80	828
Snout Length Residual	3.88	1.22	3.35	831
Schnabel Length Residual	0.89	.24	2.03	822
Orbit Width Residual	5.72	.18	0.75	548
Orbit Height Residual	4.28	.05	1.70	832
Interorbital Distance Residual	2.30	.93	3.72	826
Longest Dorsal Spine Residual	4.32	-.44	0.90	487

Table 4. Matrix of correlation coefficients between morphometric residuals.

	TL	FL	SVF	SAF	BD	CPD	HL	SnL	ScL	OW	OH	ID
Total Length	-	-	-	-	-	-	-	-	-	-	-	-
Fork Length	.731	-	-	-	-	-	-	-	-	-	-	-
Snout-Ventral Fin	.059	.048	-	-	-	-	-	-	-	-	-	-
Snout-Anal Fin	-.007	.087	.385	-	-	-	-	-	-	-	-	-
Body Depth	.137	.215	.159	.153	-	-	-	-	-	-	-	-
Caudal Peduncle Depth	.156	.240	.289	.130	.600	-	-	-	-	-	-	-
Head Length	.474	.366	.210	.066	.351	.389	-	-	-	-	-	-
Snout Length	.144	.134	.295	-.012	-.131	.179	.323	-	-	-	-	-
Schnabel Length	.303	.280	-.016	.008	.262	.256	.463	.190	-	-	-	-
Orbit Width	.403	.223	.002	-.141	-.135	-.076	.487	.091	.357	-	-	-
Orbit Height	.419	.210	-.038	-.086	-.159	-.121	.500	.106	.387	.891	-	-
Interorbital Distance	.280	.303	.020	-.112	.103	.204	.230	.129	.244	.129	.123	-
Longest Dorsal Spine	.095	.171	.193	.022	.407	.403	.157	-.071	.183	-.063	-.114	.220

n = 165

Table 5. Summary of meristic characters.

Character	Mean	Variance	Minimum	Maximum	Skewness	Kurtosis	n
Dorsal Fin Spines	14.59	1.29	9	18	-1.84	2.96	590
Dorsal Fin Rays	14.51	0.70	11	18	-0.77	2.46	833
Anal Fin Rays	7.04	0.84	3	10	-0.66	2.38	873
Pectoral Fin Rays	18.75	0.35	16	20	-0.55	0.89	832
Vertebrae	28.94	1.58	23	31	-3.13	10.21	760
Upper Gill Rakers	23.56	3.31	15	26	-2.84	9.47	761
Lower Gill Rakers	9.85	1.09	6	13	-1.43	2.77	768

Table 6. Summary of head spination.

Character	Mean	Variance	Minimum	Maximum	Skewness	Kurtosis	n
Angle Lowest Preopercular Spine	173.7°	459	100°	230°	-.64	1.29	536
Angle Middle Preopercular Spine	121.1°	347	70°	180°	-.23	-.28	539
Angle Upper Preopercular Spine	73.2°	282	30°	120°	-.14	-.63	532

Character	Both	Left Only	Right Only	Neither	n
Pre-Occipital Spine Presence	283	0	1	0	284
Supra-Occipital Spine Presence	279	4	1	0	284
Post-Occipital Spine Presence	277	3	1	2	283
Tympanic Spine Presence	280	1	1	1	283
Coronal Spine Presence	19	7	3	255	284
Parietal Spine Presence	284	0	0	0	284
Parietal-Nuchal Fusion	182	3	1	18	204

Table 7. Summary of extrinsic gasbladder muscle route.

Passing Immediately Posterior to:	2nd	3rd	4th	Ventral Rib
Number of fish with:				
Major tendon or Tendons	11	187	5	
Minor Tendon or Tendons only	41	0	2	
No Tendons	145	10	190	

Table 8: Extrinsic gasbladder muscle routes of fish in the electrophoretic sample.

M indicates route followed by major tendon.

m indicates route followed by one or more minor tendons.

Passing immediately posterior to:	Ventral Rib 2nd	3rd	4th	Number of Fish
Sebastes fasciatus				
	m	M	-	1
	m	M	m	2
	m	mM	-	3
	-	mM	-	3
	-	mM	m	4
	-	m	M	3
	m	-	M	1
			TOTAL:	17
Sebastes mentella				
	M	-	-	5
	mM	-	-	7
	M	m	-	1
			TOTAL:	13

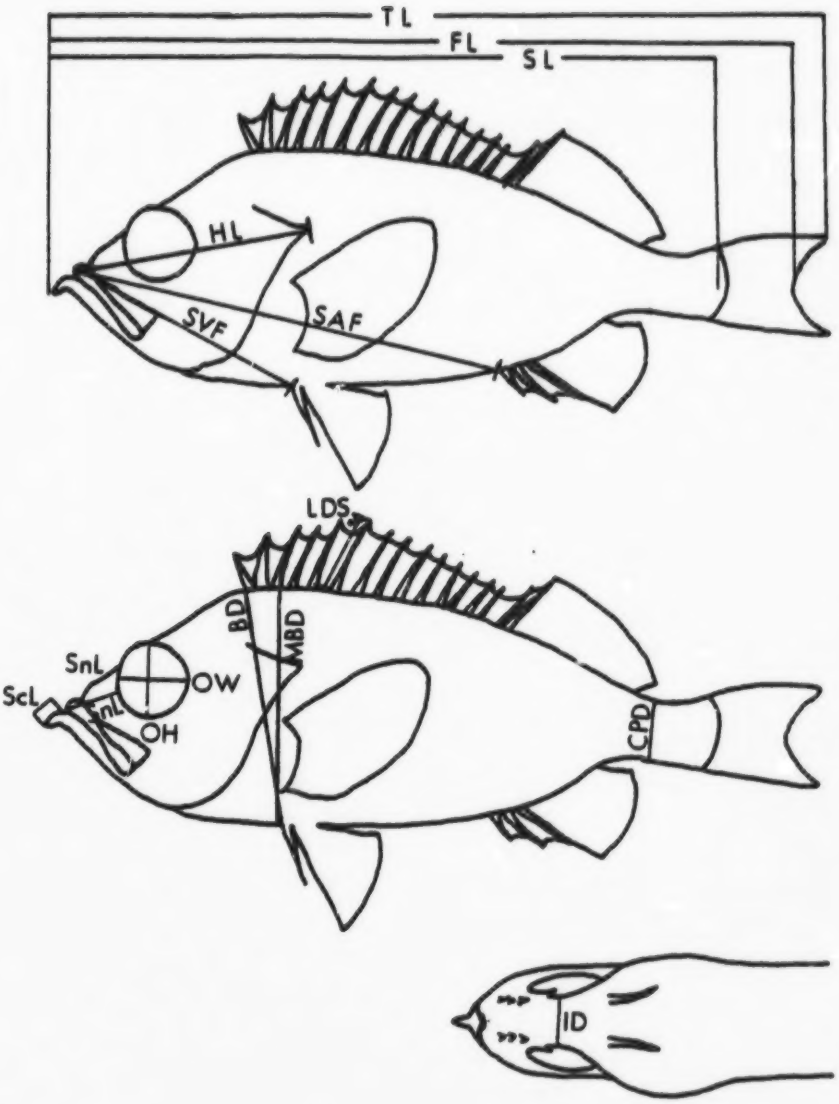


Figure 1. Morphometric Measurements Used.
BD: Body Depth, CPD: Caudal Peduncle Depth, FL: Fork Length, HL: Head Length, ID: Interorbital Distance, LDS: Longest Dorsal Fin Spine, MBD: Maximum Body Depth, OH: Orbit Height, OW: Orbit Width, SAF: Snout-Anal Fin, ScL: Schnabel Length, SL: Standard Length, SnL: Snout Length, SVF: Snout-Ventral Fin, TL: Total Length.

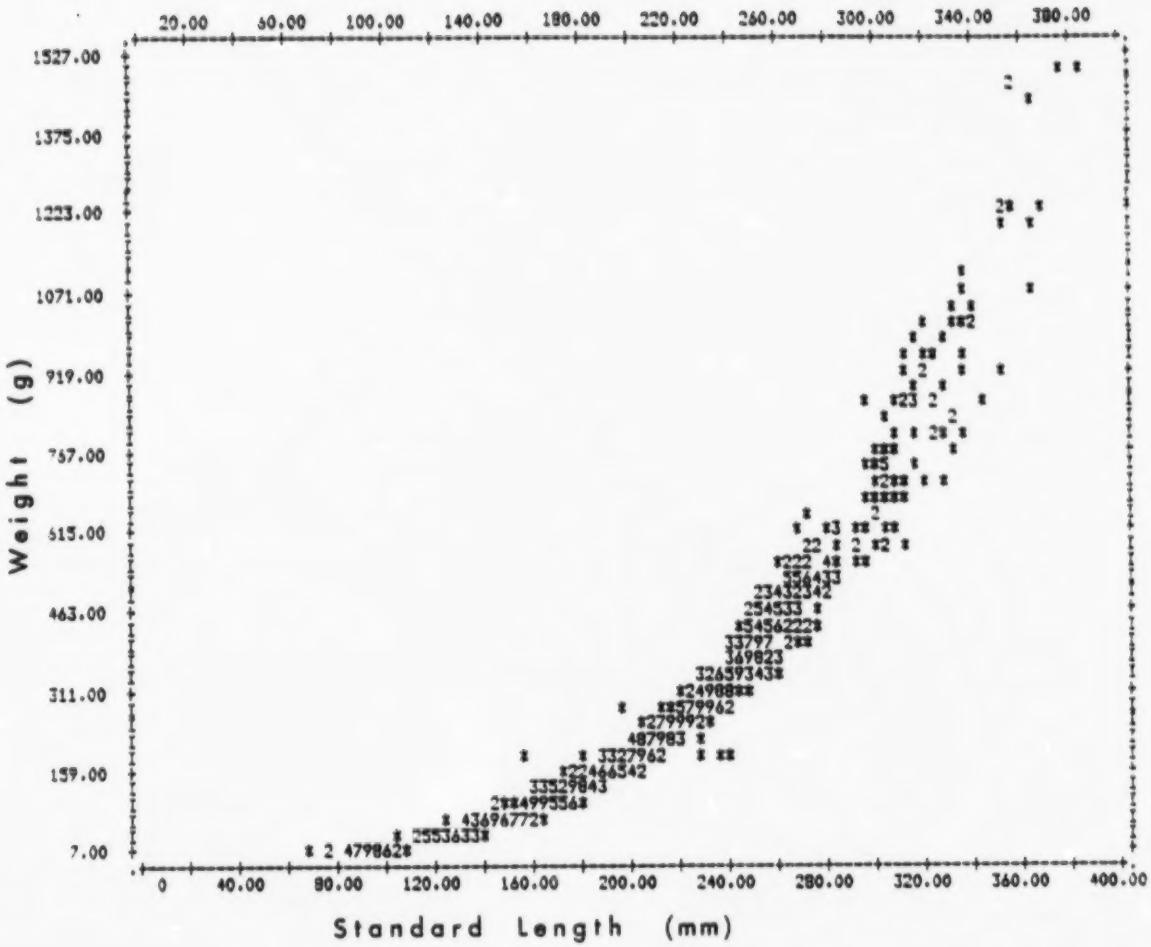


Figure 2. Length-Weight Relationship (in grams and millimetres).
* indicates a single fish; 2 to 8 indicate numbers of fish with the same measurements; 9 indicates 9 or more fish with the same measurements.

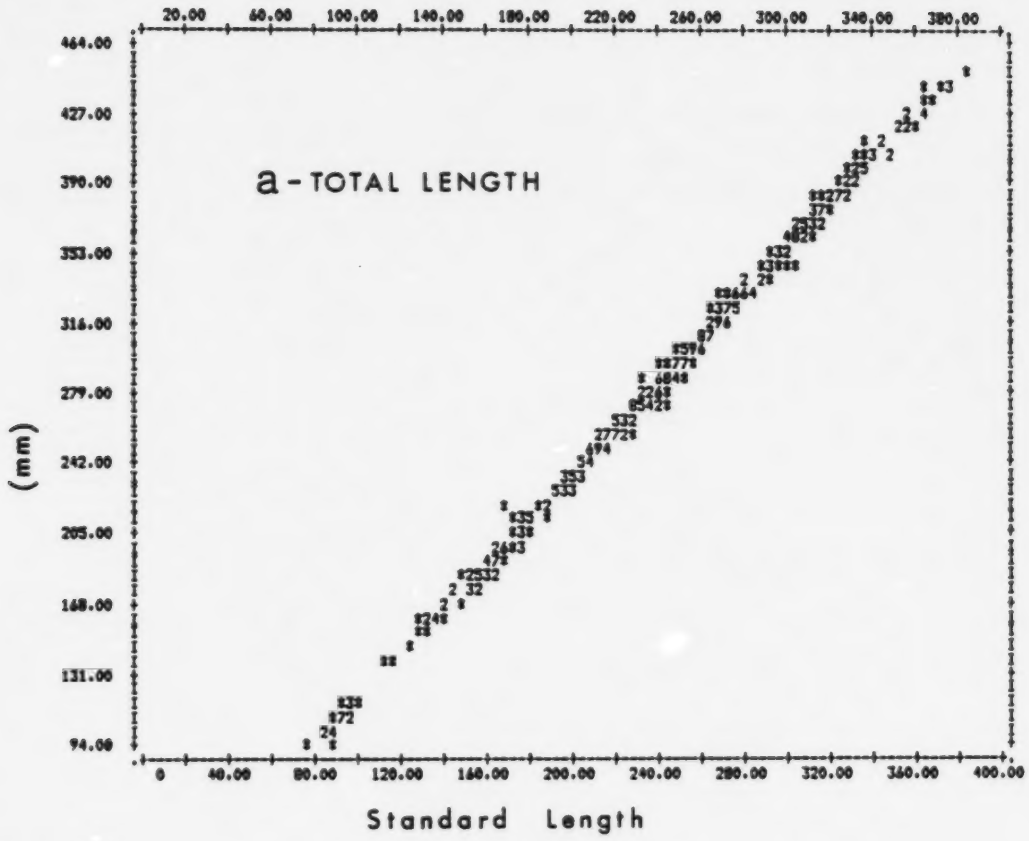
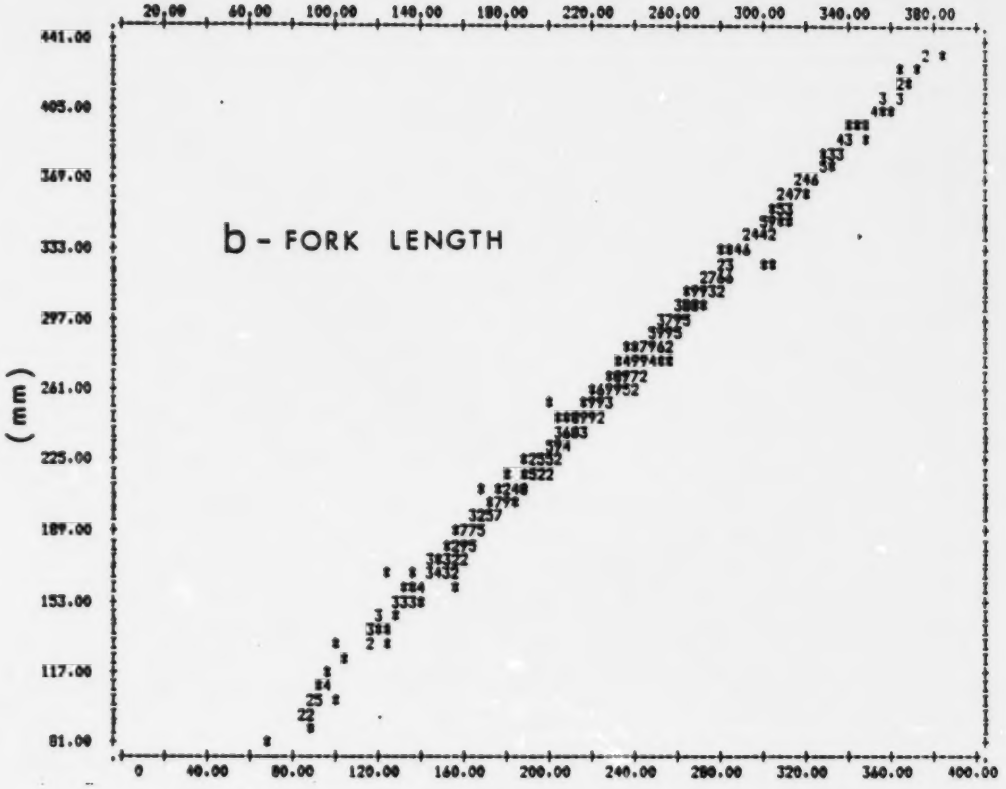


Figure 3. Morphometric Characters Plotted Against Standard Length (all in millimetres. Symbols as in Figure 2. Statistics in Table 2). a: Total Length, b: Fork Length, c: Snout-Ventral Fin, d: Snout-Anal Fin, e: Body Depth, f: Caudal Peduncle Depth, g: Head Length, h: Snout Length, i: Schnabel Length, j: Orbit Width, k: Orbit Height, l: Interorbital Distance, m: Longest Dorsal Spine.


b - FORK LENGTH
(mm)
20.00
60.00
100.00
140.00
180.00
220.00
260.00
300.00
340.00
380.00
441.00
405.00
369.00
333.00
297.00
261.00
225.00
189.00
153.00
117.00
81.00
0
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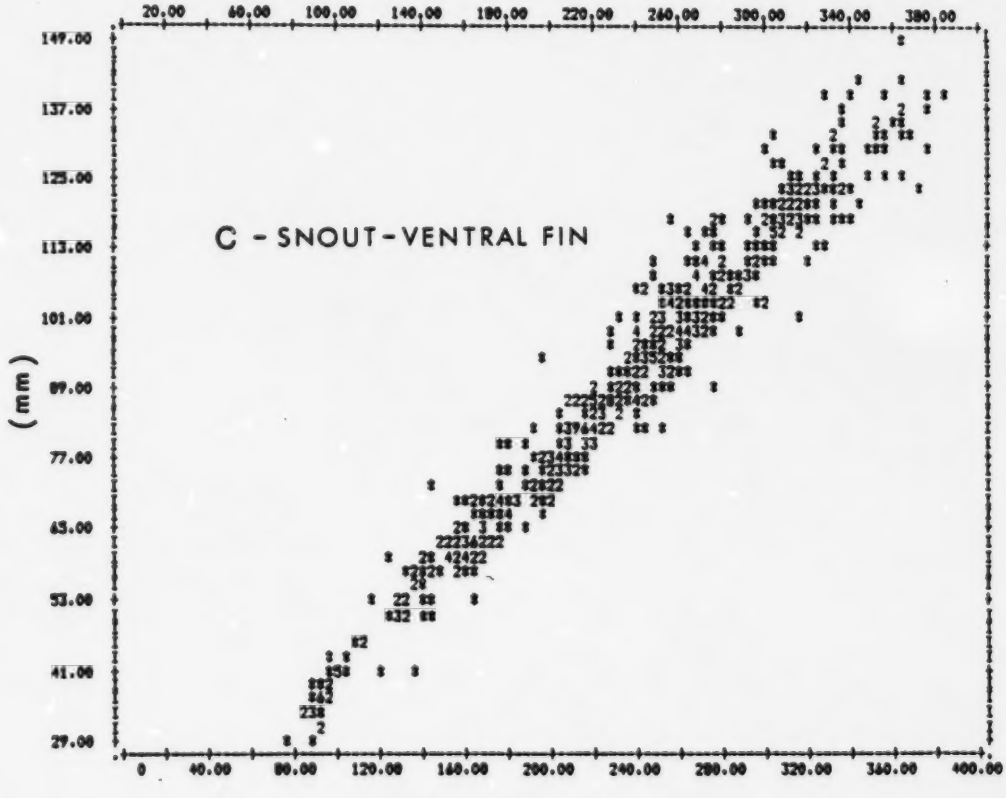
240.00
280.00
320.00
360.00
400.00


C - SNOUT-VENTRAL FIN
(mm)
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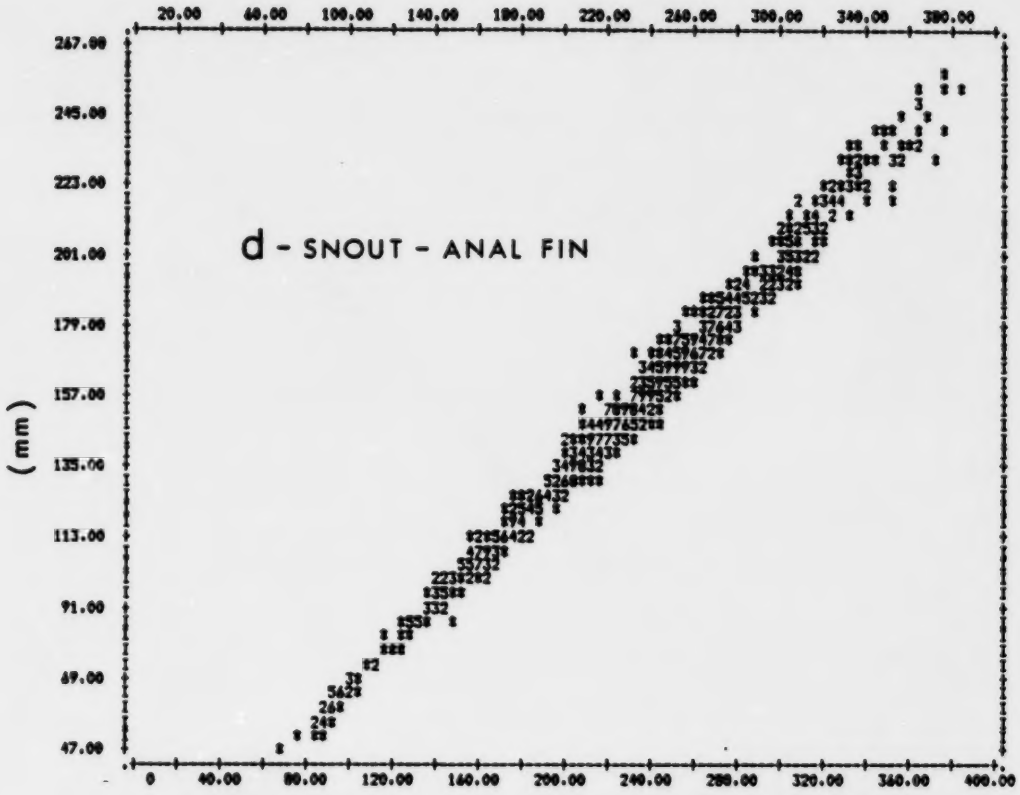
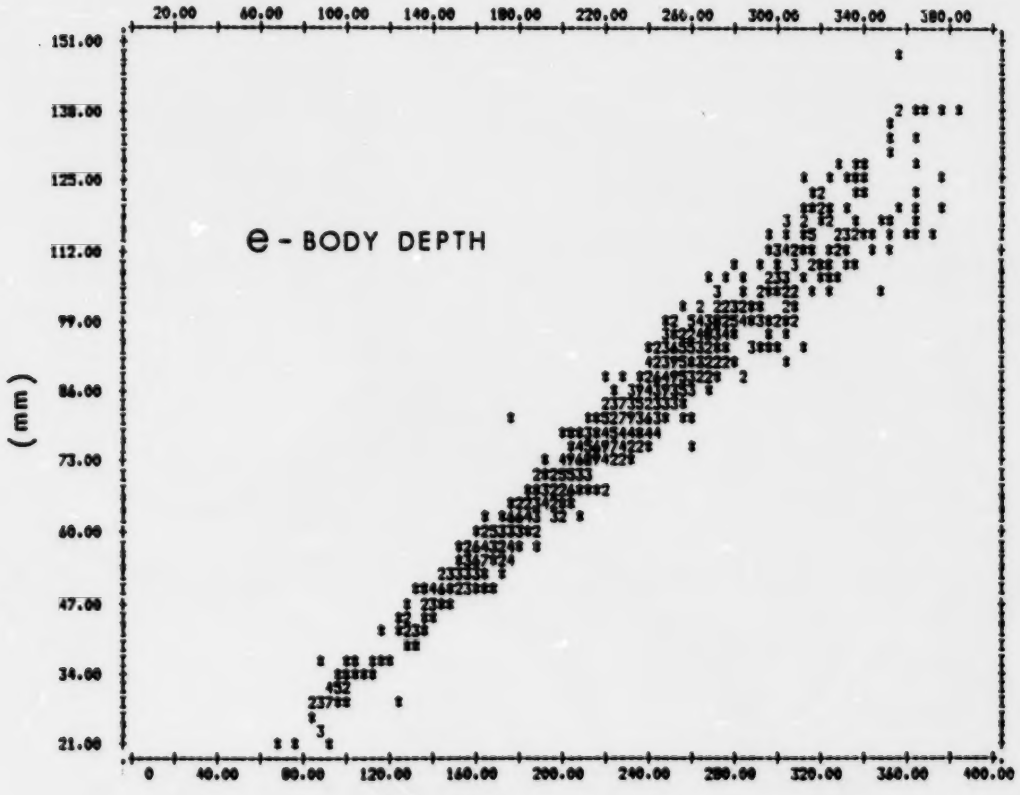
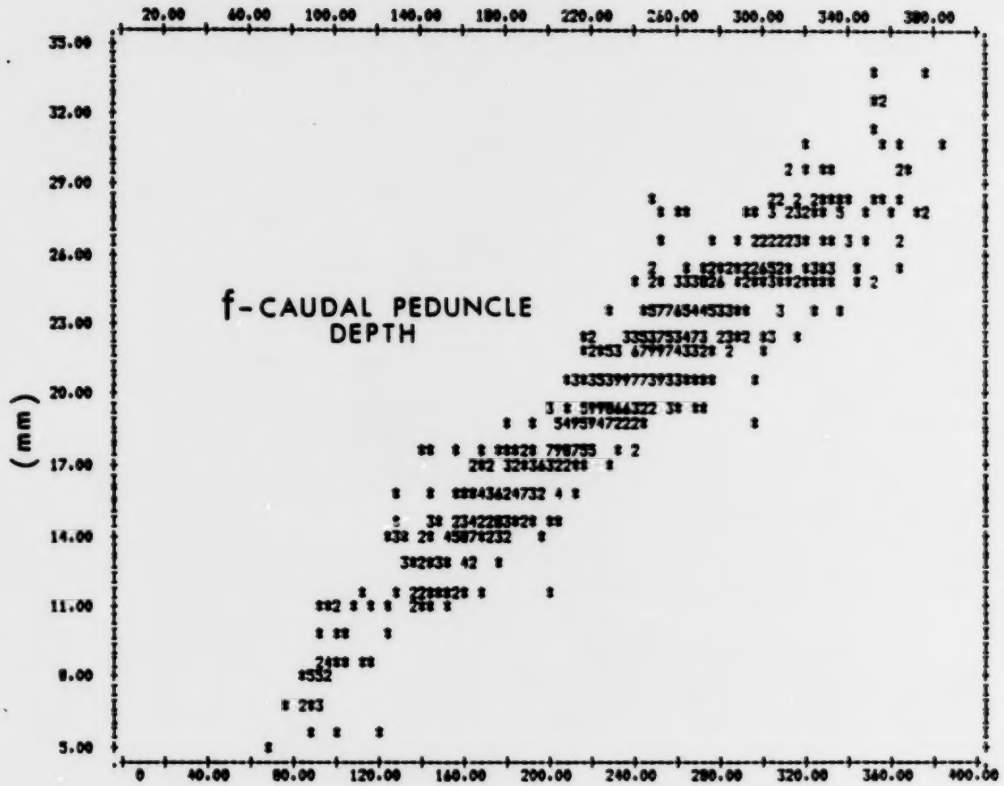
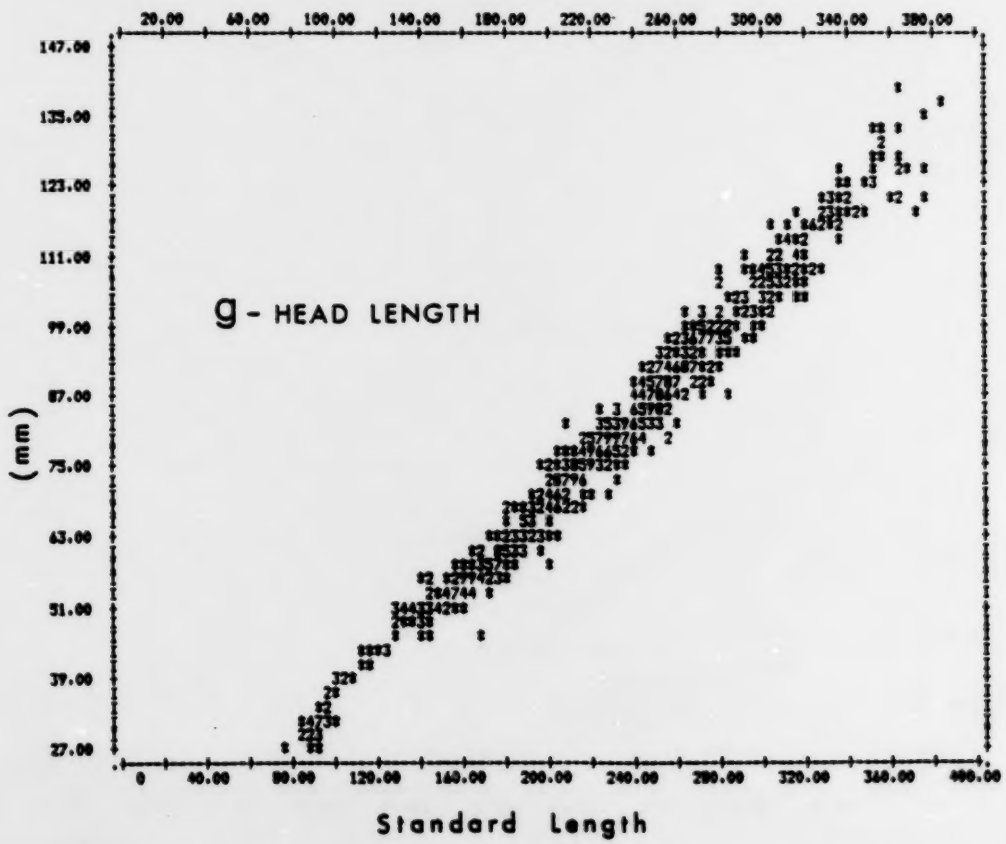
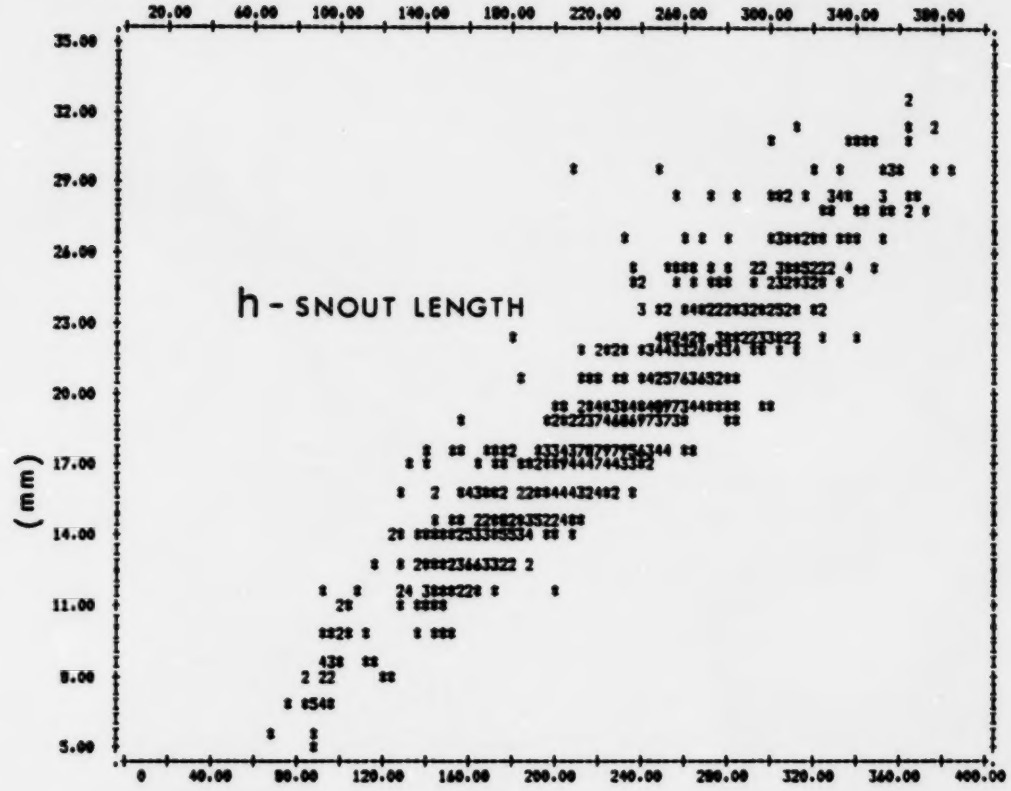
60.00
100.00
140.00
180.00
220.00
260.00
300.00
340.00
380.00
149.00
137.00
125.00
113.00
101.00
89.00
77.00
65.00
53.00
41.00
29.00
0
40.00
80.00
120.00
160.00
200.00
240.00
280.00
320.00
360.00
400.00
Standard Length

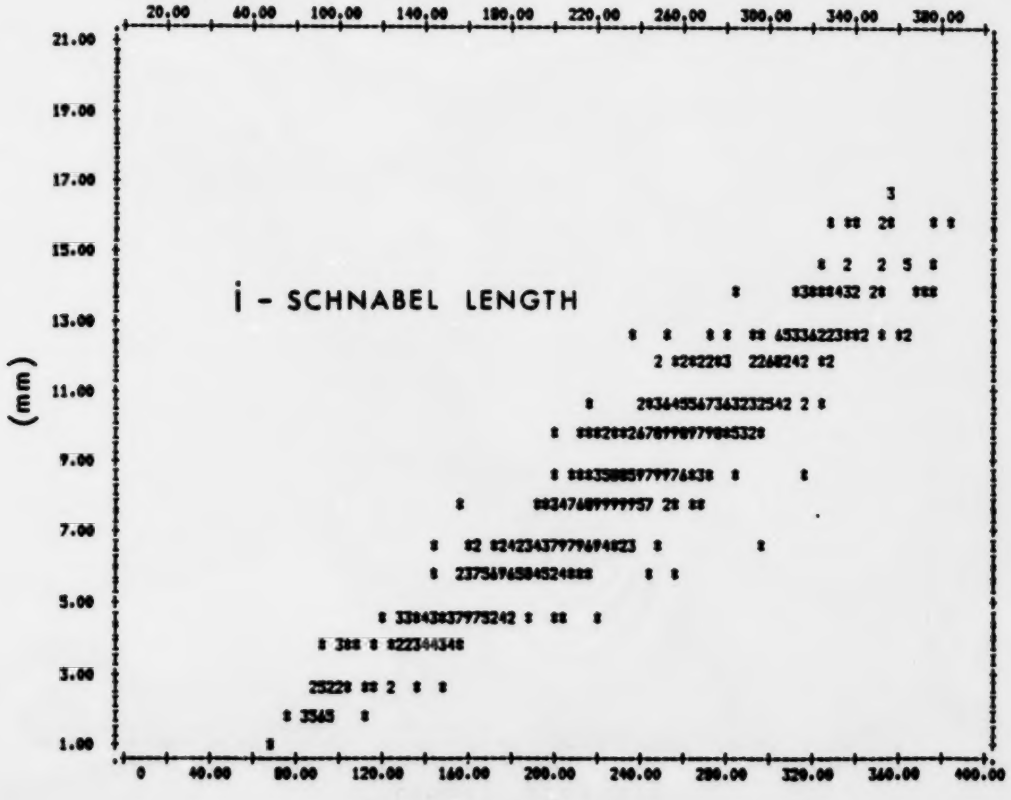

d - SNOUT - ANAL FIN
(mm)

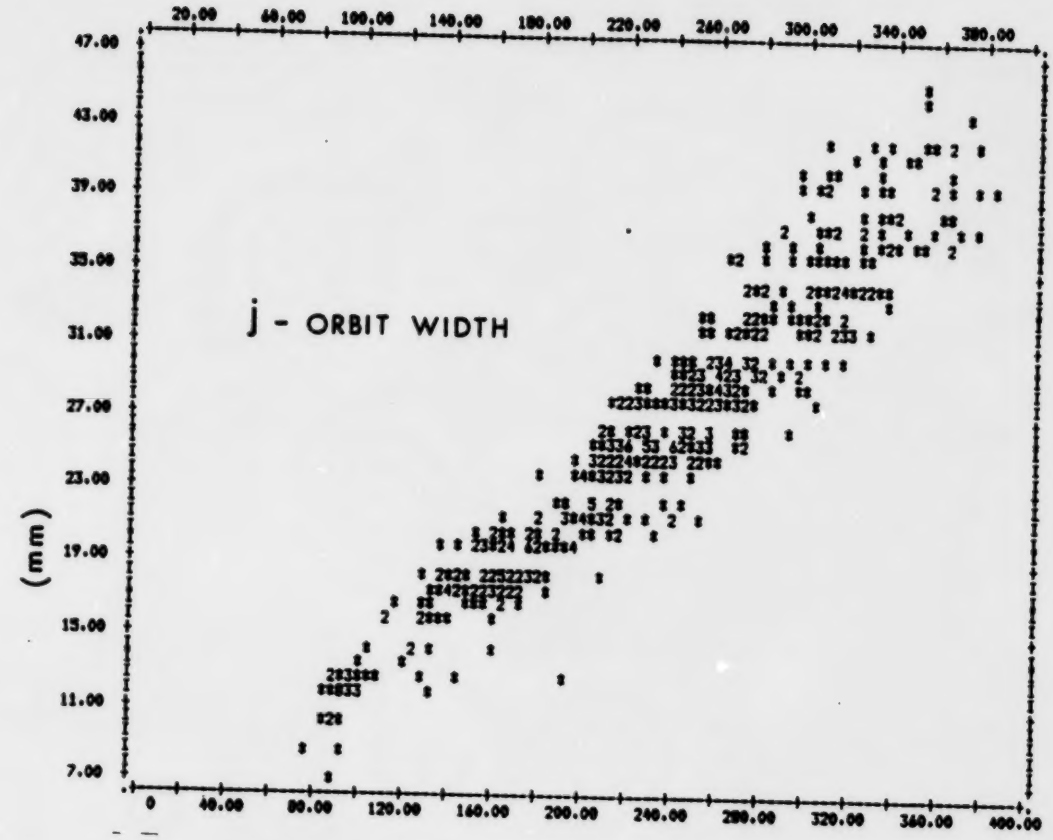

e - BODY DEPTH
(mm)
Standard Length


f - CAUDAL PEDUNCLE DEPTH
(mm)


g - HEAD LENGTH
(mm)
Standard Length


h - SNOUT LENGTH
(mm)


i - SCHNABEL LENGTH
(mm)
Standard Length


j - ORBIT WIDTH
(mm)
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40.00
100.00
140.00
180.00
220.00
260.00
300.00
340.00
380.00
47.00
43.00
39.00
35.00
31.00
27.00
23.00
19.00
15.00
11.00
7.00
0
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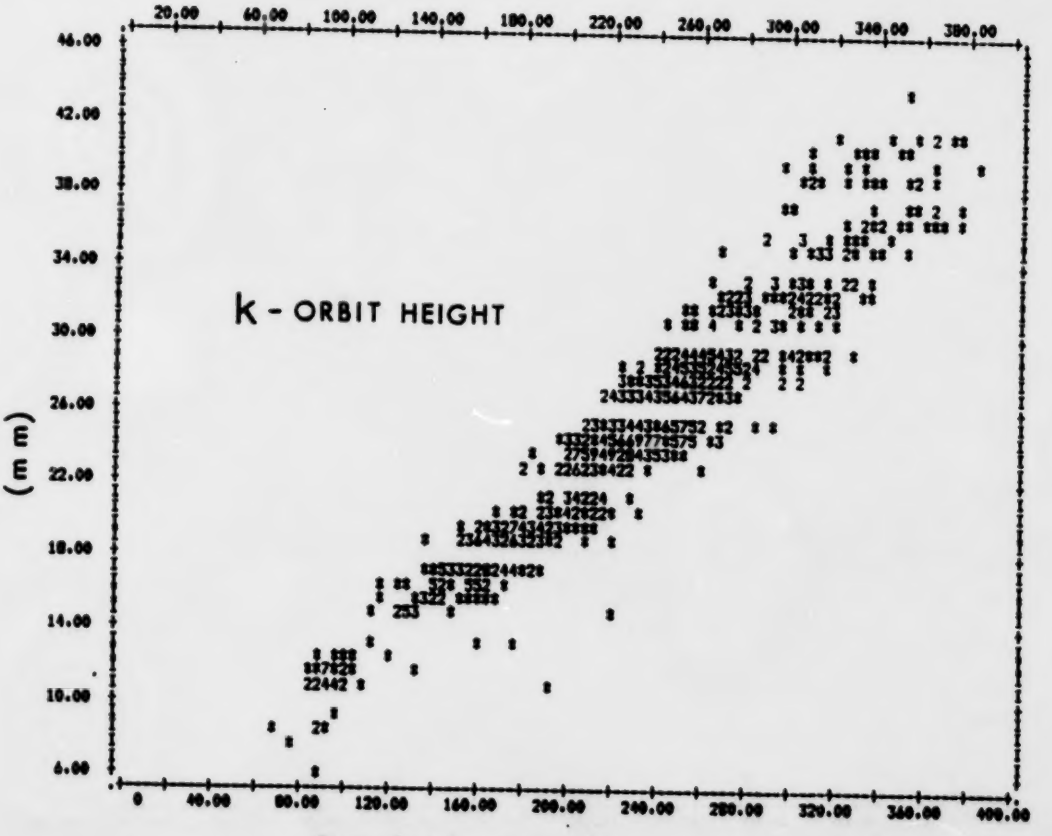
80.00
120.00
160.00
200.00
240.00
280.00
320.00
360.00
400.00


k - ORBIT HEIGHT
(mm)
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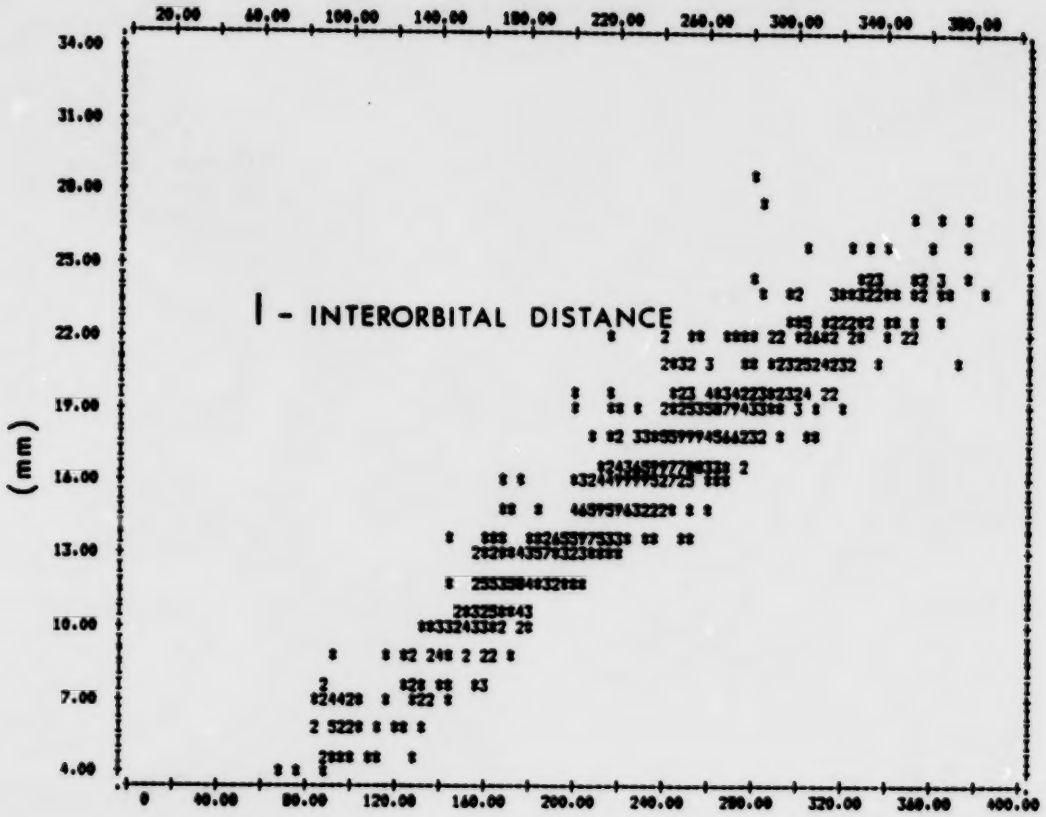
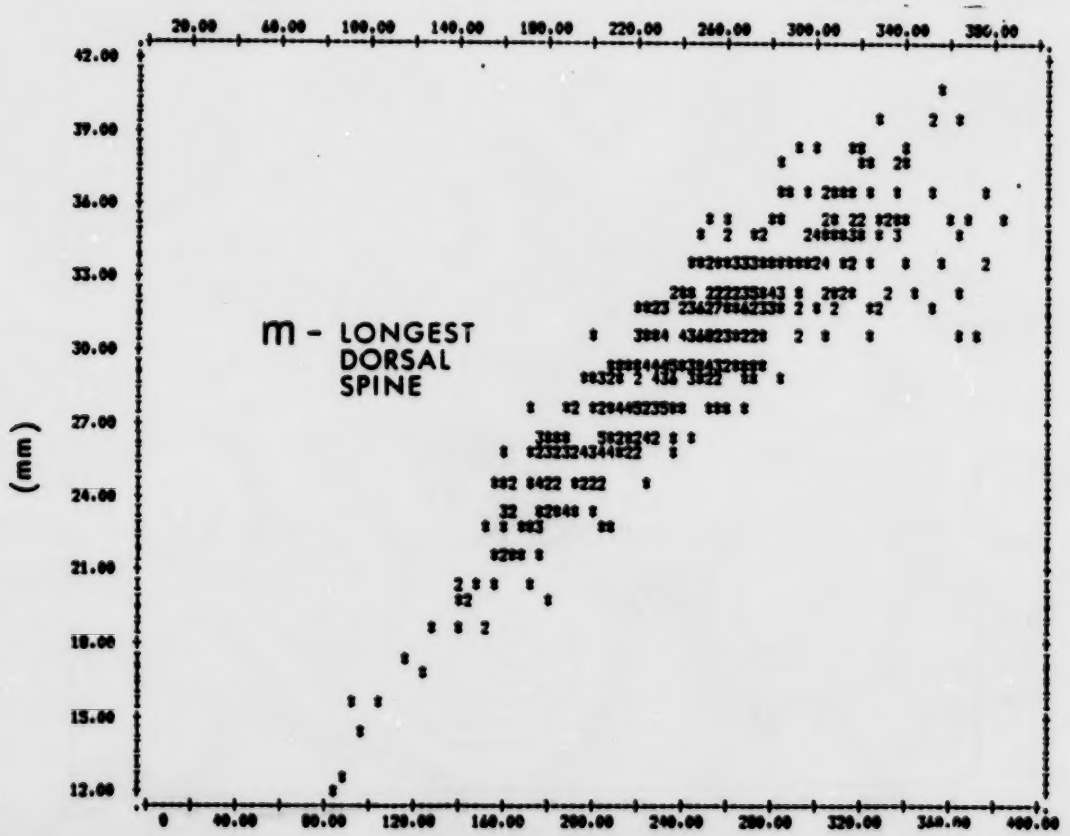
100.00
140.00
180.00
220.00
260.00
300.00
340.00
380.00
46.00
42.00
38.00
34.00
30.00
26.00
22.00
18.00
14.00
10.00
6.00
0
40.00
80.00
120.00
160.00
200.00
240.00
280.00
320.00
360.00
400.00
Standard Length


I - INTERORBITAL DISTANCE
(mm)


m - LONGEST DORSAL SPINE
(mm)
Standard Length

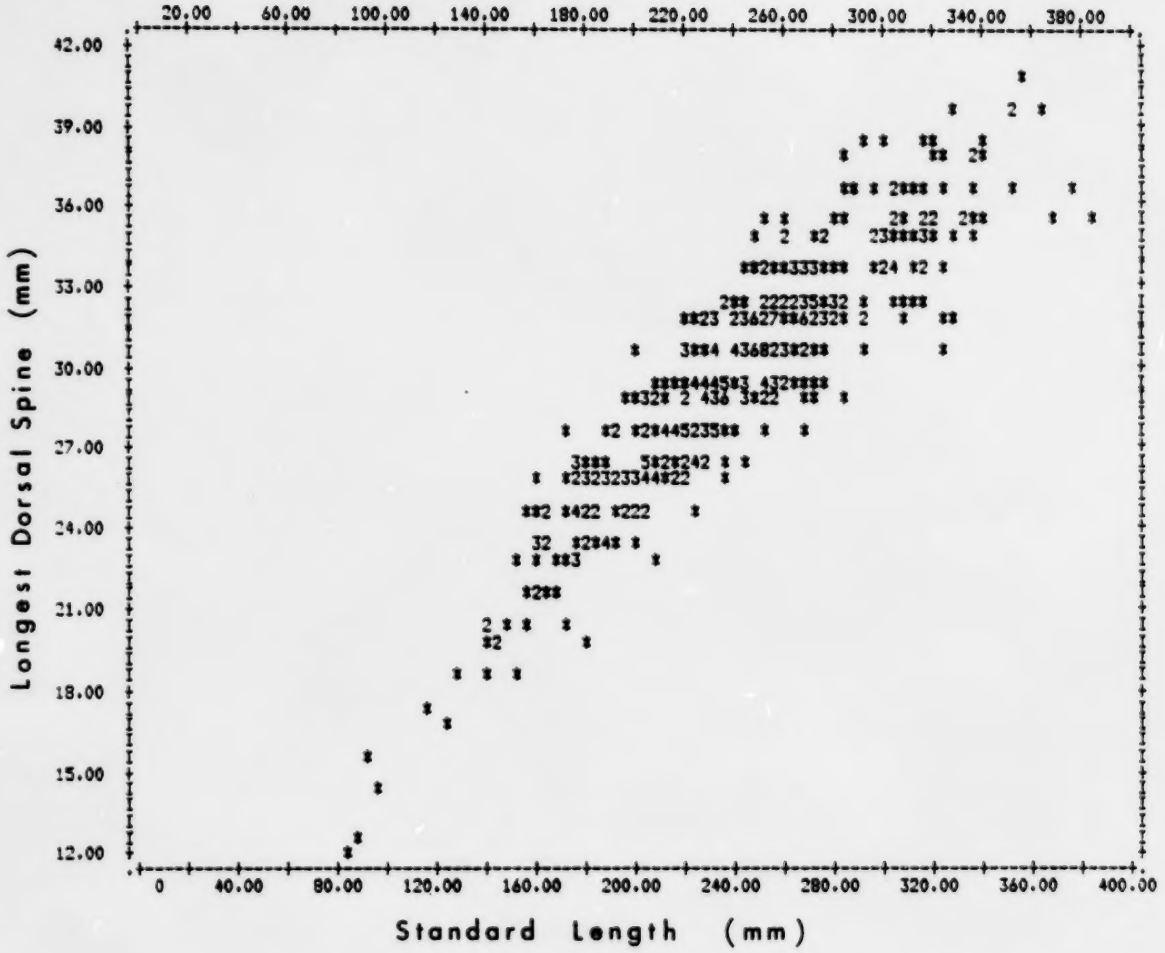


Figure 4. Length of Longest Dorsal Spine plotted against Standard Length, for fish identified as Sebastes fasciatus only. (Both in millimetres. Symbols as in Figure 2.)

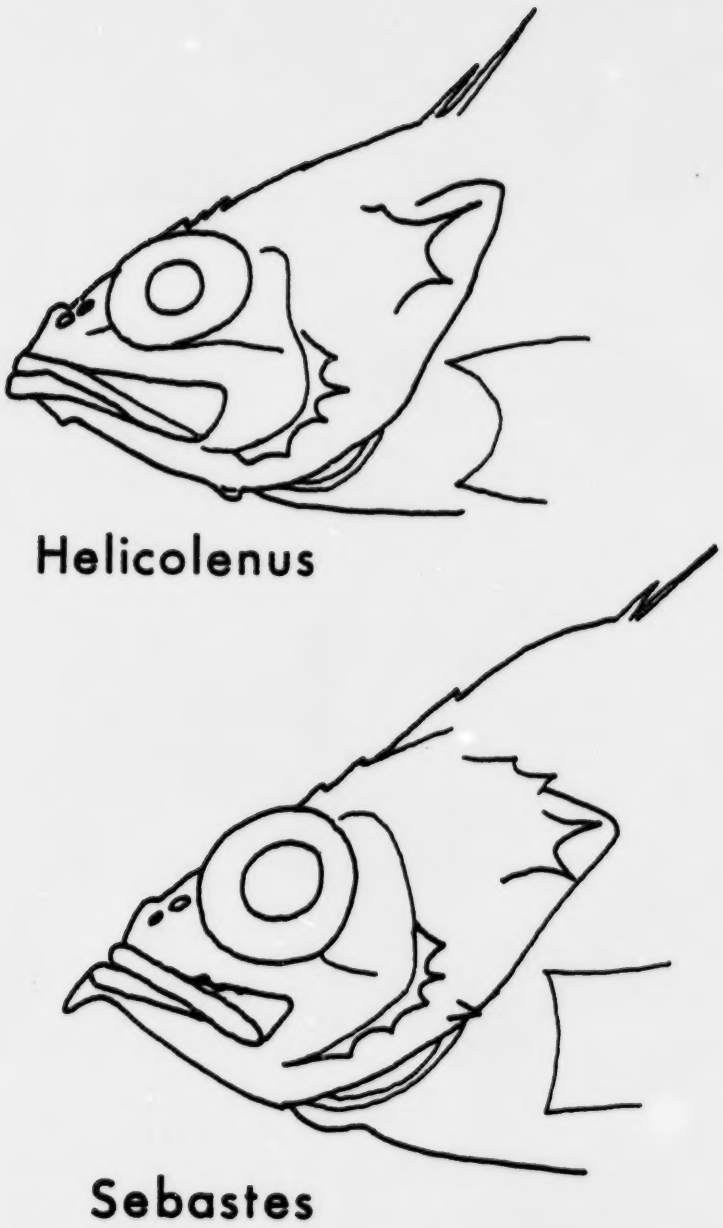


Figure 5. Comparison of Head Shapes of Helicolenus dactylopterus and Sebastes fasciatus to aid in their Rapid Identification during surveys. (Drawn from Preserved Specimens.)
Note: Low, curved "forehead" of Helicolenus versus high straight one of Sebastes ; oval eye of Helicolenus versus circular one of Sebastes ; equal jaws and mouth that closes in Helicolenus versus protruding lower jaw and permanently open mouth in Sebastes ; and (not visible in figure) markedly concave interorbital in Helicolenus versus flat one in Sebastes. The eye diameter and schnabel length in Sebastes are variable and cannot be used as generic characters.

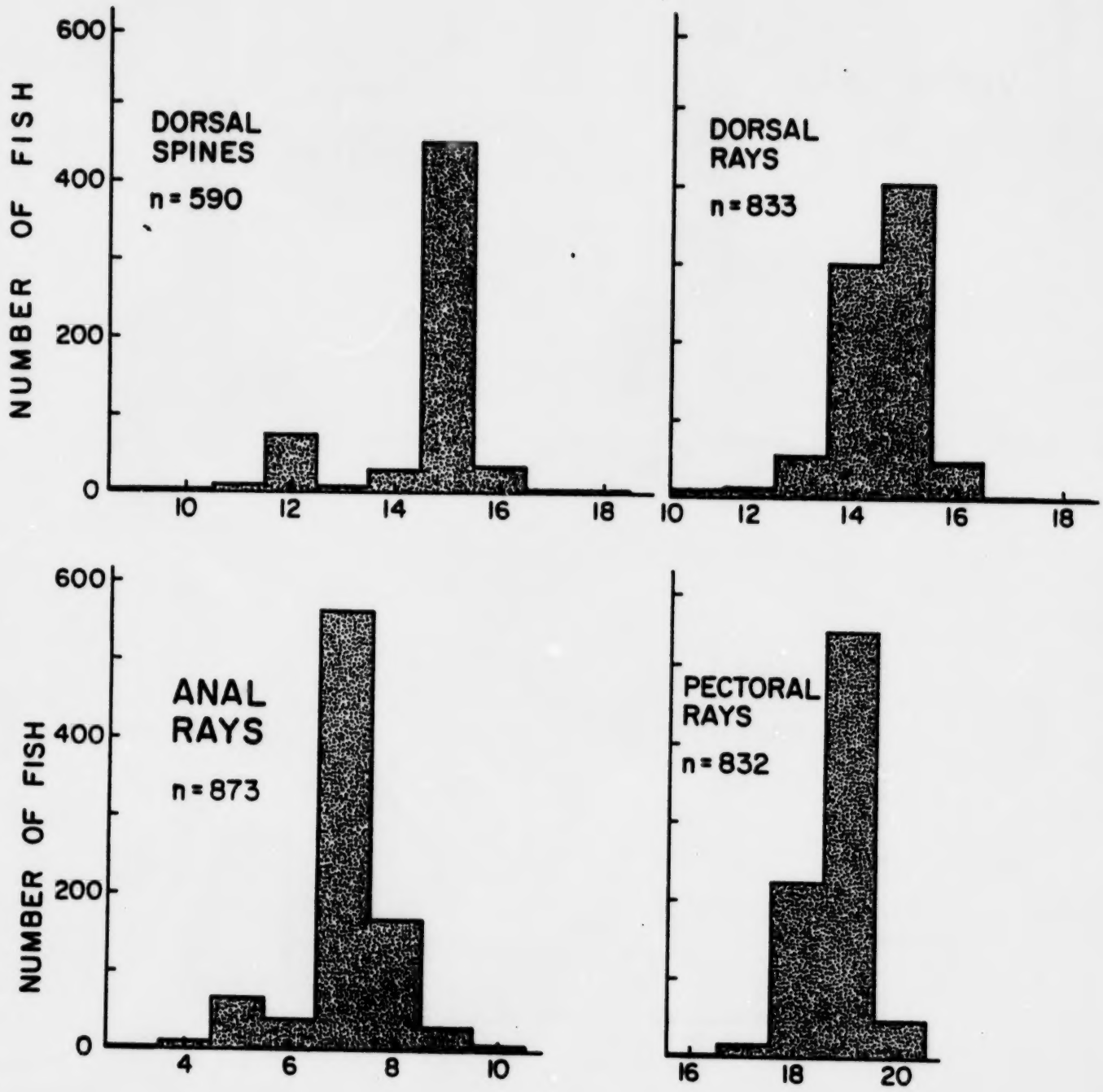
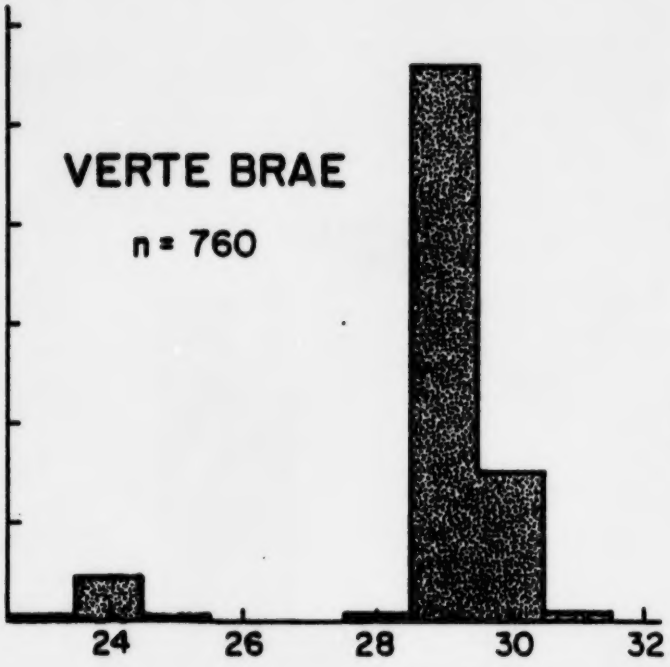
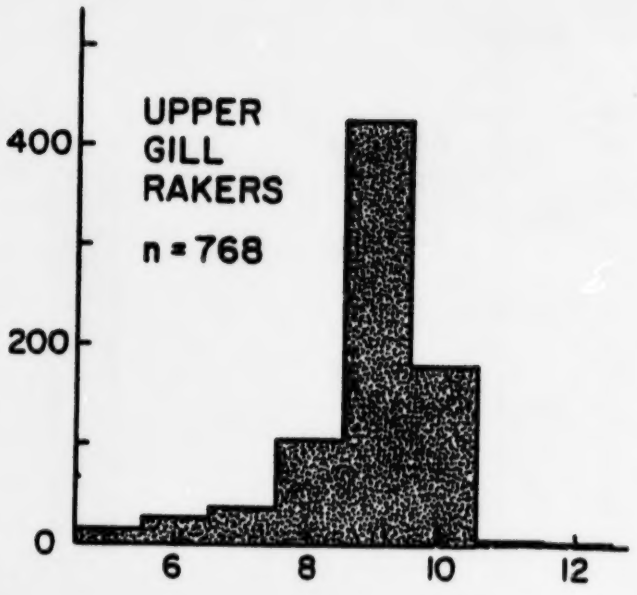
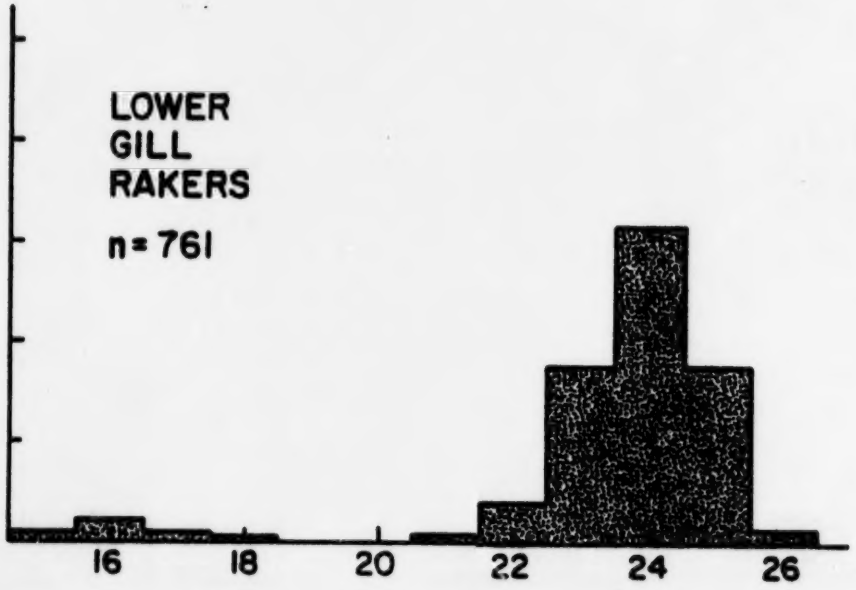


Figure 6. Histograms of Meristic Characters.
Note: Total gill raker count exceeds the sum of upper and lower counts by one. See text.


VERTE BRAE
n = 760
24
26
28
30
32


UPPER
GILL
RAKERS
n = 768
400
200
0
6
8
10
12


LOWER
GILL
RAKERS
n = 761
16
18
20
22
24
26

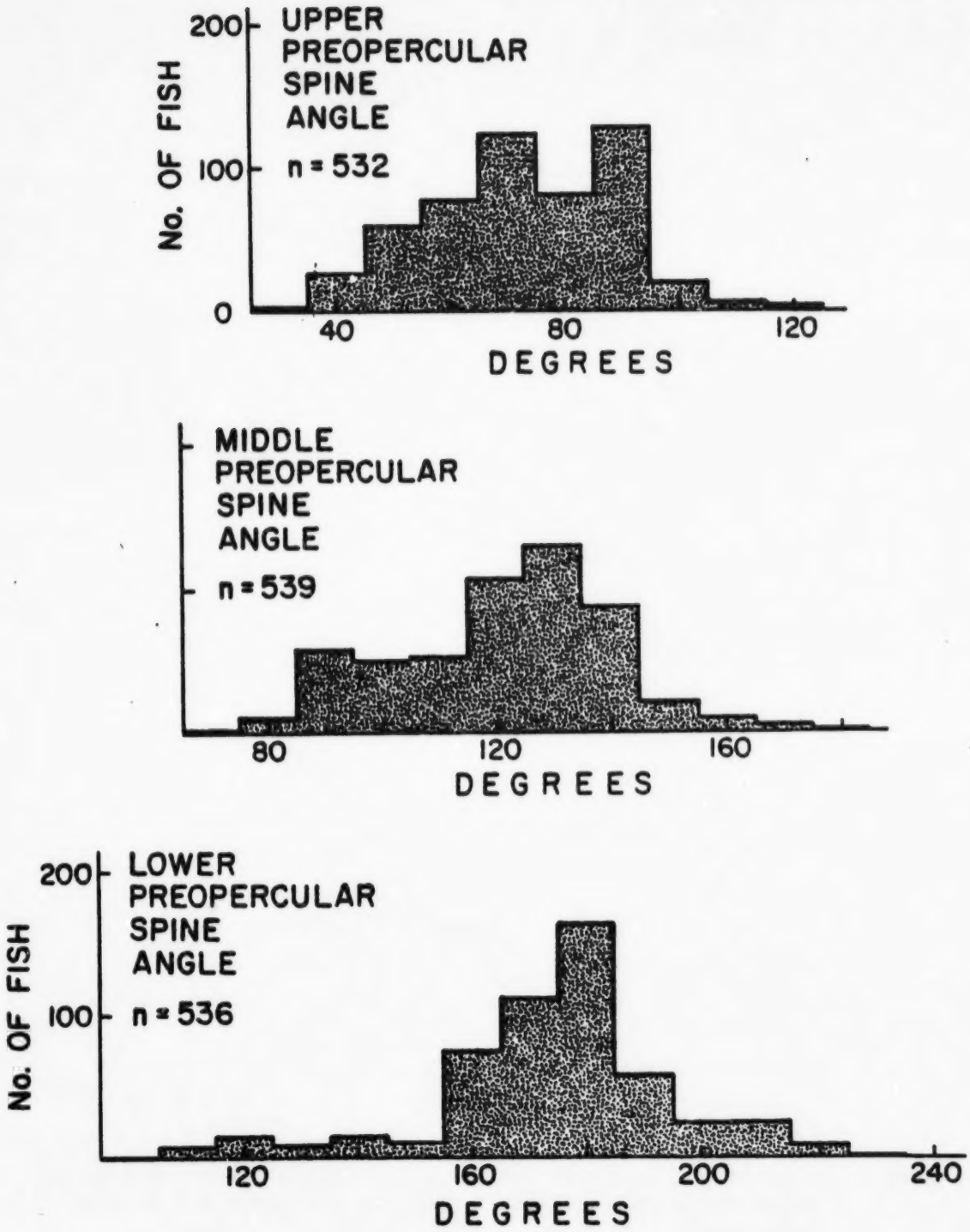


Figure 7. Histograms of Pre-Opercular Spine Angles. (See text for explanation of angular measures used.)

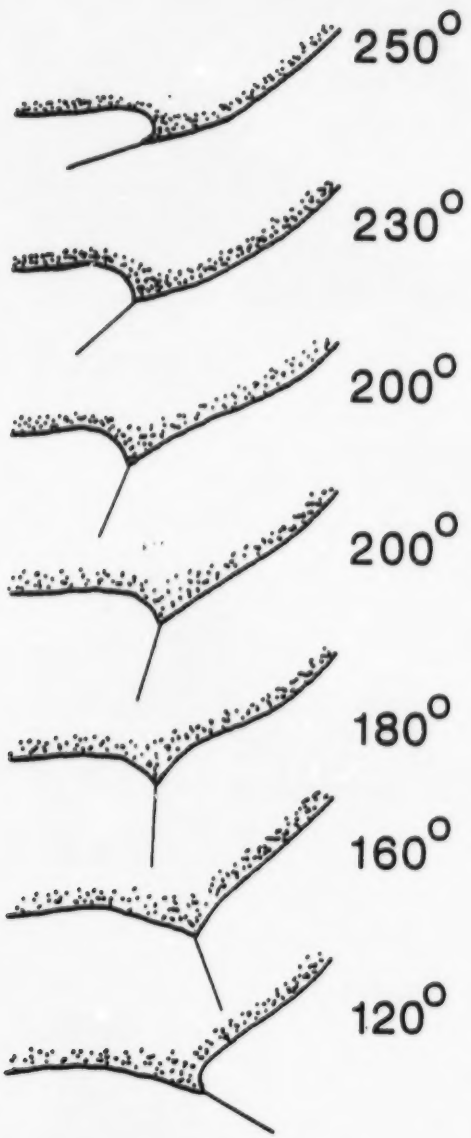


Figure 8. Diagram to Illustrate the Large Changes in Lower Preopercular Spine Angle that can Result from Small Alterations in Bone Development.

APPENDIX 1

This appendix includes the data listing for the 876 fish of the main collection. They are arranged by cruise and set number. Most of the columns are self explanatory or explained in the methods section. The others are:

Cruise: Official cruise number. The letter prefix indicates the ship used. "SMB" indicates the four inshore fish from St. Margarets Bay, N.S.

Set: Sequential set number for the cruise. The positions and average depths of these sets are given in table 1.

Fish: Number given at the time of processing.

Head Spines: "B" indicates present on both sides, "L" on left side only, "R" on right side only, and "N" indicates absent on both sides.

Parietal-Nuchal Ridges: "FUS" indicates fused and "SEP" separate.

Peritoneal Colour: "BLK" indicates black, "DGR" dark grey, "SGR" silver grey, and "SLV" silver.

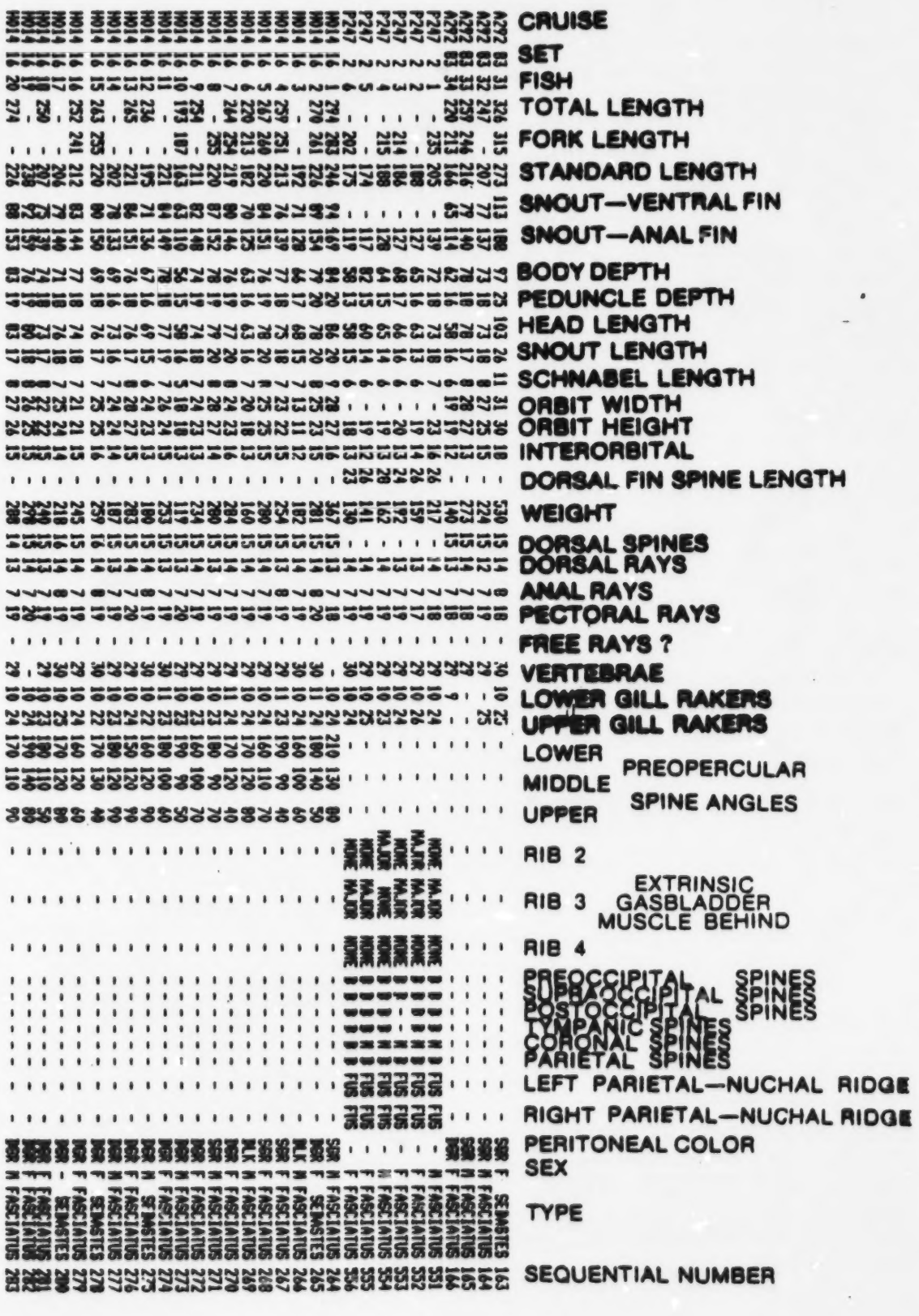
Sex: "M" indicates male, "F" female.

Type: "HELICO." indicates fish identified as Helicolenus dactylopterus; "FASCIATUS", ones that were identified as Sebastes fasciatus; "MENTELLA", ones that were identified as S. mentella; "SEBASTES", ones of unknown species; and "UNKNOWN", the sole fish of unknown genus.

Sequential Number: These numbers follow the order in which the fish were processed, their order in the computer file deposited with the EDP coordinator of Marine Fish Divison and their sequential numbers in printouts of analyses of these data.

The morphometrics are in millimetres, the weights are in grams, the meristics are counts, and the angles are in degrees. Missing data are marked with a hyphen.

A292	CRUISE
83	SET
1	FISH
-	TOTAL LENGTH
-	FORK LENGTH
264	STANDARD LENGTH
92	SNOUT—VENTRAL FIN
173	SNOUT—ANAL FIN
100	BODY DEPTH
26	PEDUNCLE DEPTH
93	HEAD LENGTH
25	SNOUT LENGTH
11	SCHNABEL LENGTH
30	ORBIT WIDTH
28	ORBIT HEIGHT
18	INTERORBITAL
-	DORSAL FIN SPINE LENGTH
481	WEIGHT
15	DORSAL SPINES
13	DORSAL RAYS
7	ANAL RAYS
19	PECTORAL RAYS
-	FREE RAYS ?
-	VERTEBRAE
-	LOWER GILL RAKERS
-	UPPER GILL RAKERS
149	LOWER
100	MIDDLE — PREOPERCULAR SPINE ANGLES
40	UPPER
-	RIB 2
-	RIB 3 — EXTRINSIC GASBLADDER MUSCLE BEHIND
-	RIB 4
-	PREOCCIPITAL SPINES
-	SUPRAOCCIPITAL SPINES
-	POSTOCCIPITAL SPINES
-	TYMPANIC SPINES
-	CORONAL SPINES
-	PARIETAL SPINES
-	LEFT PARIETAL—NUCHAL RIDGE
-	RIGHT PARIETAL—NUCHAL RIDGE
SBR	PERITONEAL COLOR
F	SEX
FASCIATUS	TYPE
133	SEQUENTIAL NUMBER


CRUISE
SET
FISH
TOTAL LENGTH
FORK LENGTH
STANDARD LENGTH
SNOUT—VENTRAL FIN
SNOUT—ANAL FIN
BODY DEPTH
PEDUNCLE DEPTH
HEAD LENGTH
SNOUT LENGTH
SCHNABEL LENGTH
ORBIT WIDTH
ORBIT HEIGHT
INTERORBITAL
DORSAL FIN SPINE LENGTH
WEIGHT
DORSAL SPINES
DORSAL RAYS
ANAL RAYS
PECTORAL RAYS
FREE RAYS ?
VERTEBRAE
LOWER GILL RAKERS
UPPER GILL RAKERS
LOWER
MIDDLE
UPPER
PREOPERCULAR SPINE ANGLES
RIB 2
RIB 3
RIB 4
EXTRINSIC GASBLADDER MUSCLE BEHIND
PREOCCIPITAL SPINES
SUPRAOCCIPITAL SPINES
POSTOCCIPITAL SPINES
TYMPANIC SPINES
CORONAL SPINES
PARIETAL SPINES
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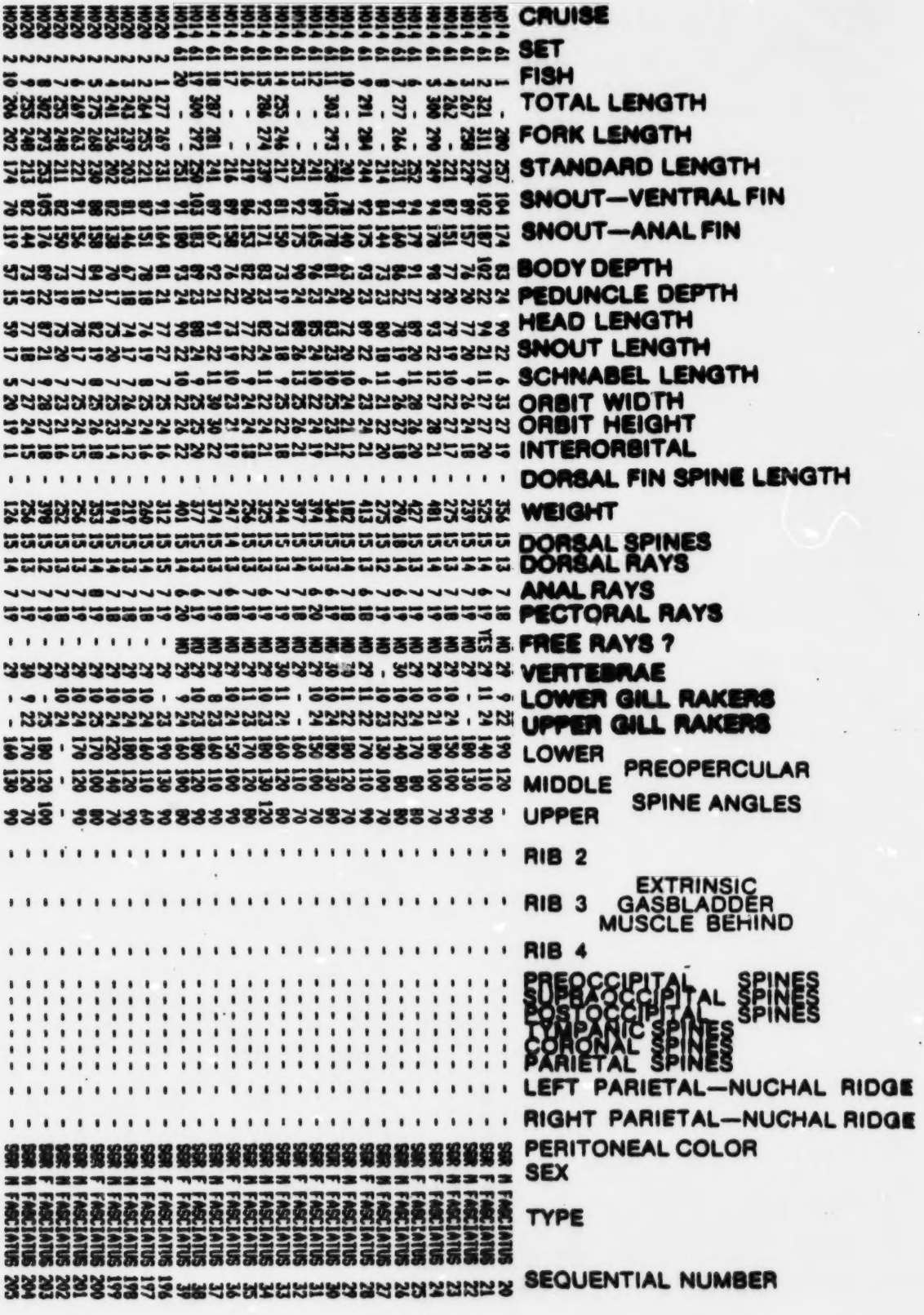
RIGHT PARIETAL—NUCHAL RIDGE
PERITONEAL COLOR
SEX
TYPE
SEQUENTIAL NUMBER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TOTAL LENGTH
FORK LENGTH
STANDARD LENGTH
SNOUT—VENTRAL FIN
SNOUT—ANAL FIN
BODY DEPTH
PEDUNCLE DEPTH
HEAD LENGTH
SNOUT LENGTH
SCHNABEL LENGTH
ORBIT WIDTH
ORBIT HEIGHT
INTERORBITAL
DORSAL FIN SPINE LENGTH
WEIGHT
DORSAL SPINES
DORSAL RAYS
ANAL RAYS
PECTORAL RAYS
FREE RAYS ?
VERTEBRAE
LOWER GILL RAKERS
UPPER GILL RAKERS
LOWER
MIDDLE
UPPER
PREOPERCULAR SPINE ANGLES
RIB 2
RIB 3
EXTRINSIC GASBLADDER MUSCLE BEHIND
RIB 4
PREOCCIPITAL SPINES
SUBOCCIPITAL SPINES
POSTOCCIPITAL SPINES
TYMPANIC SPINES
CORONAL SPINES
PARIETAL SPINES
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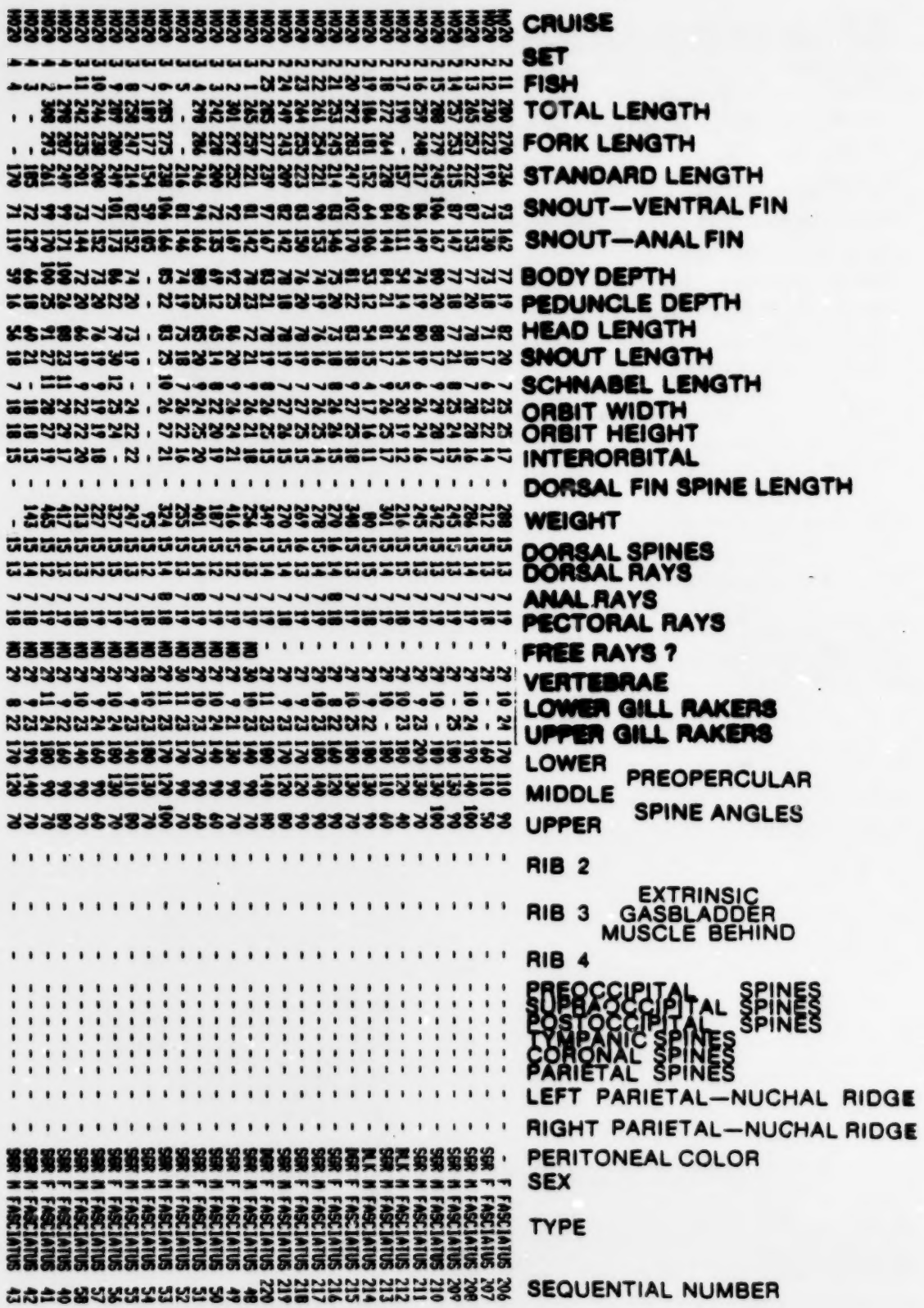
RIGHT PARIETAL—NUCHAL RIDGE
PERITONEAL COLOR
SEX
TYPE
SEQUENTIAL NUMBER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SNOUT—ANAL FIN
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PEDUNCLE DEPTH
HEAD LENGTH
SNOUT LENGTH
SCHNABEL LENGTH
ORBIT WIDTH
ORBIT HEIGHT
INTERORBITAL
DORSAL FIN SPINE LENGTH
WEIGHT
DORSAL SPINES
DORSAL RAYS
ANAL RAYS
PECTORAL RAYS
FREE RAYS ?
VERTEBRAE
LOWER GILL RAKERS
UPPER GILL RAKERS
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MIDDLE
UPPER
PREOPERCULAR SPINE ANGLES
RIB 2
RIB 3
EXTRINSIC GASBLADDER MUSCLE BEHIND
RIB 4
PREOCCIPITAL SPINES
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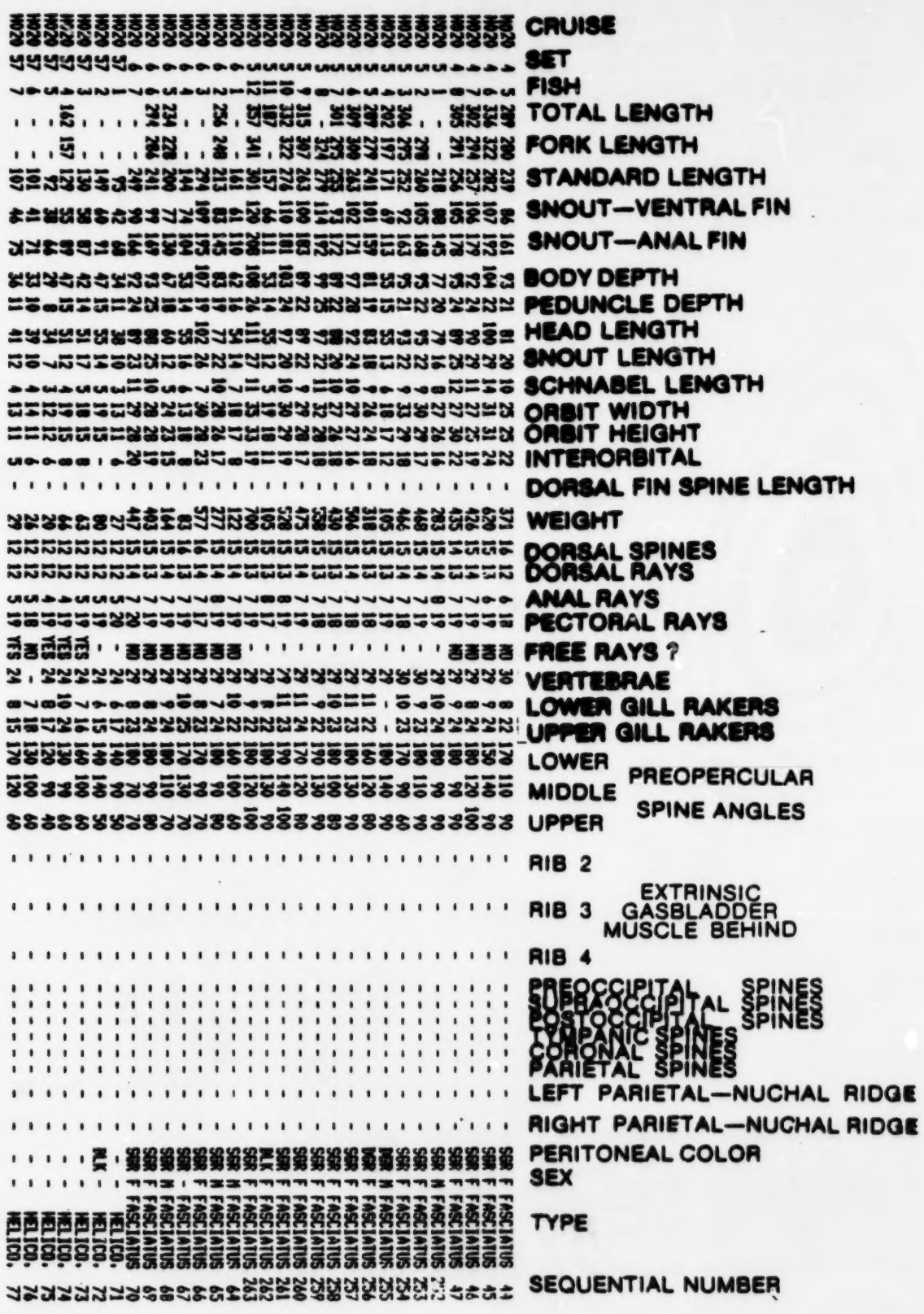
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SNOUT—ANAL FIN
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HEAD LENGTH
SNOUT LENGTH
SCHNABEL LENGTH
ORBIT WIDTH
ORBIT HEIGHT
INTERORBITAL
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DORSAL SPINES
DORSAL RAYS
ANAL RAYS
PECTORAL RAYS
FREE RAYS ?
VERTEBRAE
LOWER GILL RAKERS
UPPER GILL RAKERS
LOWER
MIDDLE
UPPER
PREOPERCULAR SPINE ANGLES
RIB 2
RIB 3
EXTRINSIC GASBLADDER MUSCLE BEHIND
RIB 4
PREOCCIPITAL SPINES
SUPRAOCCIPITAL SPINES
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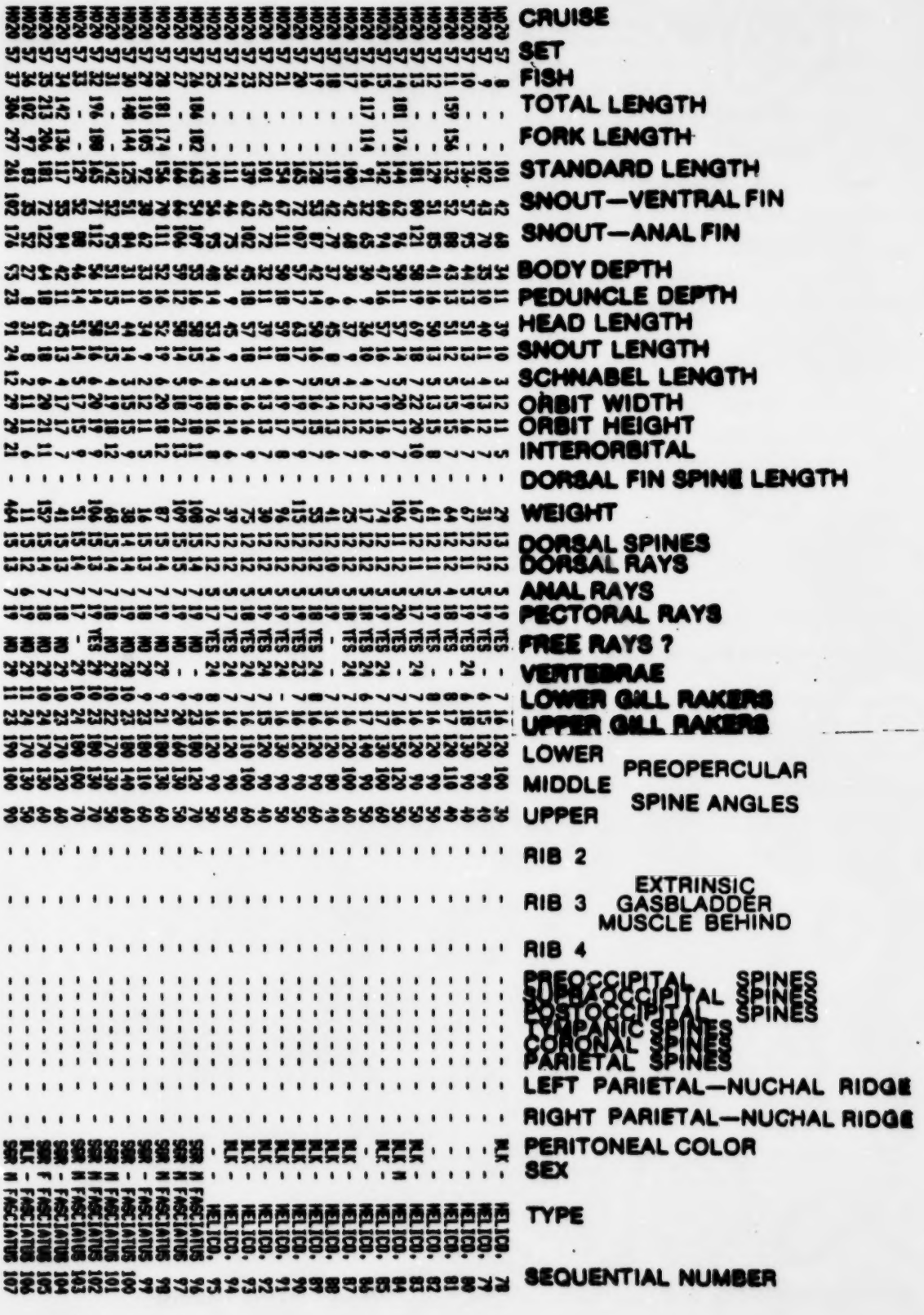
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SNOUT LENGTH
SCHNABEL LENGTH
ORBIT WIDTH
ORBIT HEIGHT
INTERORBITAL
DORSAL FIN SPINE LENGTH
WEIGHT
DORSAL SPINES
DORSAL RAYS
ANAL RAYS
PECTORAL RAYS
FREE RAYS ?
VERTEBRAE
LOWER GILL RAKERS
UPPER GILL RAKERS
LOWER
MIDDLE
UPPER
PREOPERCULAR SPINE ANGLES
RIB 2
RIB 3
EXTRINSIC GASBLADDER MUSCLE BEHIND
RIB 4
PREOCCIPITAL SPINES
SUPRAOCCIPITAL SPINES
POSTOCCIPITAL SPINES
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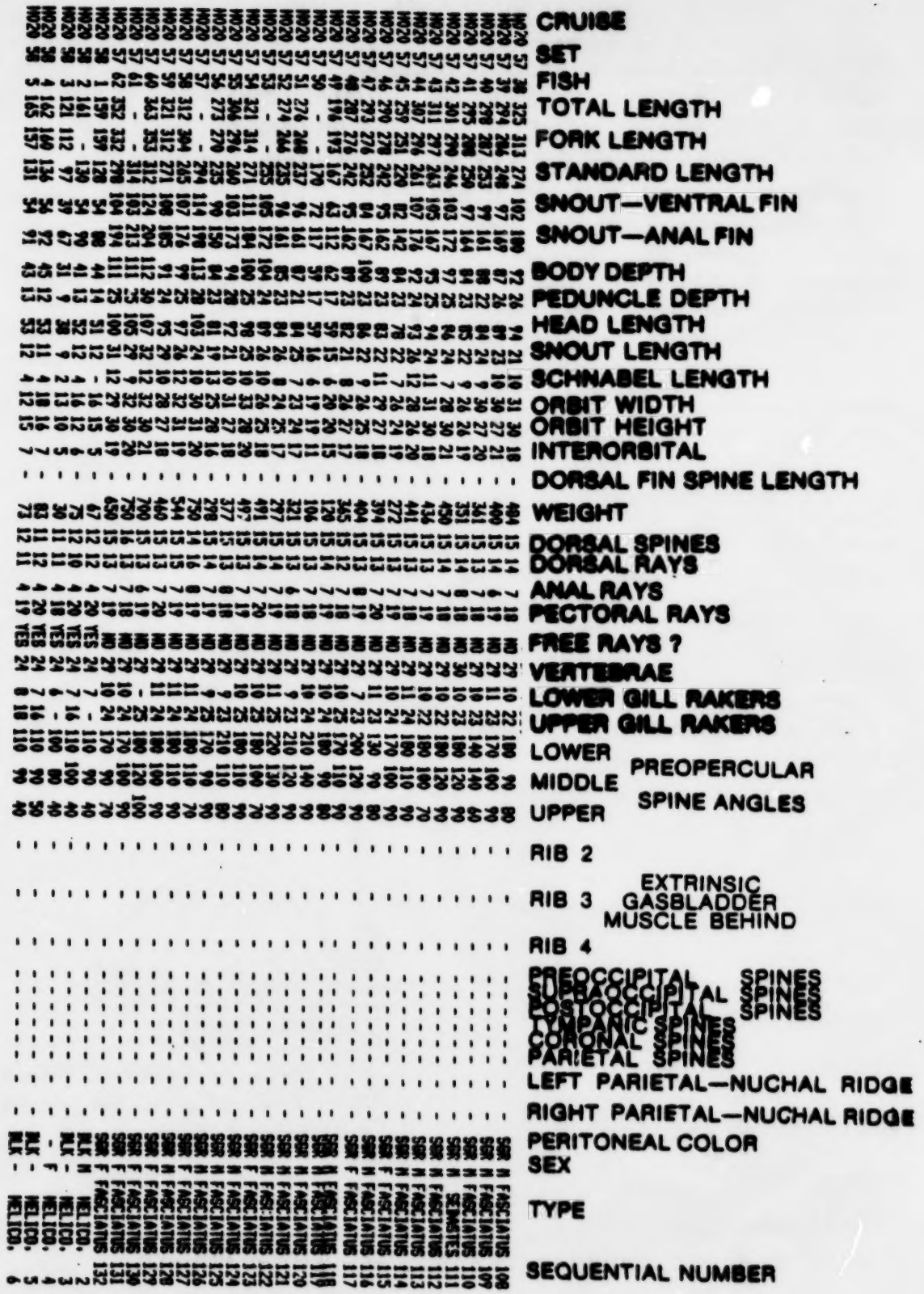
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SNOUT—ANAL FIN
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HEAD LENGTH
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ORBIT HEIGHT
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ANAL RAYS
PECTORAL RAYS
FREE RAYS ?
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RIB 3
EXTRINSIC GASBLADDER MUSCLE BEHIND
RIB 4
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SUPRAOCCIPITAL SPINES
POSTOCCIPITAL SPINES
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CORONAL SPINES
PARIETAL SPINES
LEFT PARIETAL—NUCHAL RIDGE
RIGHT PARIETAL—NUCHAL RIDGE
PERITONEAL COLOR
SEX
TYPE
SEQUENTIAL NUMBER

MV2021	CRUISE
44	SET
15	FISH
244	TOTAL LENGTH
282	FORK LENGTH
246	STANDARD LENGTH
69	SNOUT—VENTRAL FIN
154	SNOUT—ANAL FIN
57	BODY DEPTH
24	PEDUNCLE DEPTH
55	HEAD LENGTH
22	SNOUT LENGTH
4	SCHNABEL LENGTH
36	ORBIT WIDTH
28	ORBIT HEIGHT
17	INTERORBITAL
.	DORSAL FIN SPINE LENGTH
49	WEIGHT
15	DORSAL SPINES
13	DORSAL RAYS
7	ANAL RAYS
19	PECTORAL RAYS
.	FREE RAYS ?
36	VERTEBRAE
4	LOWER GILL RAKERS
23	UPPER GILL RAKERS
170	LOWER
184	MIDDLE PREOPERCULAR
88	UPPER SPINE ANGLES
.	RIB 2
.	RIB 3 EXTRINSIC GASBLADDER MUSCLE BEHIND
.	RIB 4
.	PREOCCIPITAL SPINES
.	SUPRAOCCIPITAL SPINES
.	POSTOCCIPITAL SPINES
.	TYMPANIC SPINES
.	CORONAL SPINES
.	PARIETAL SPINES
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.	SEX
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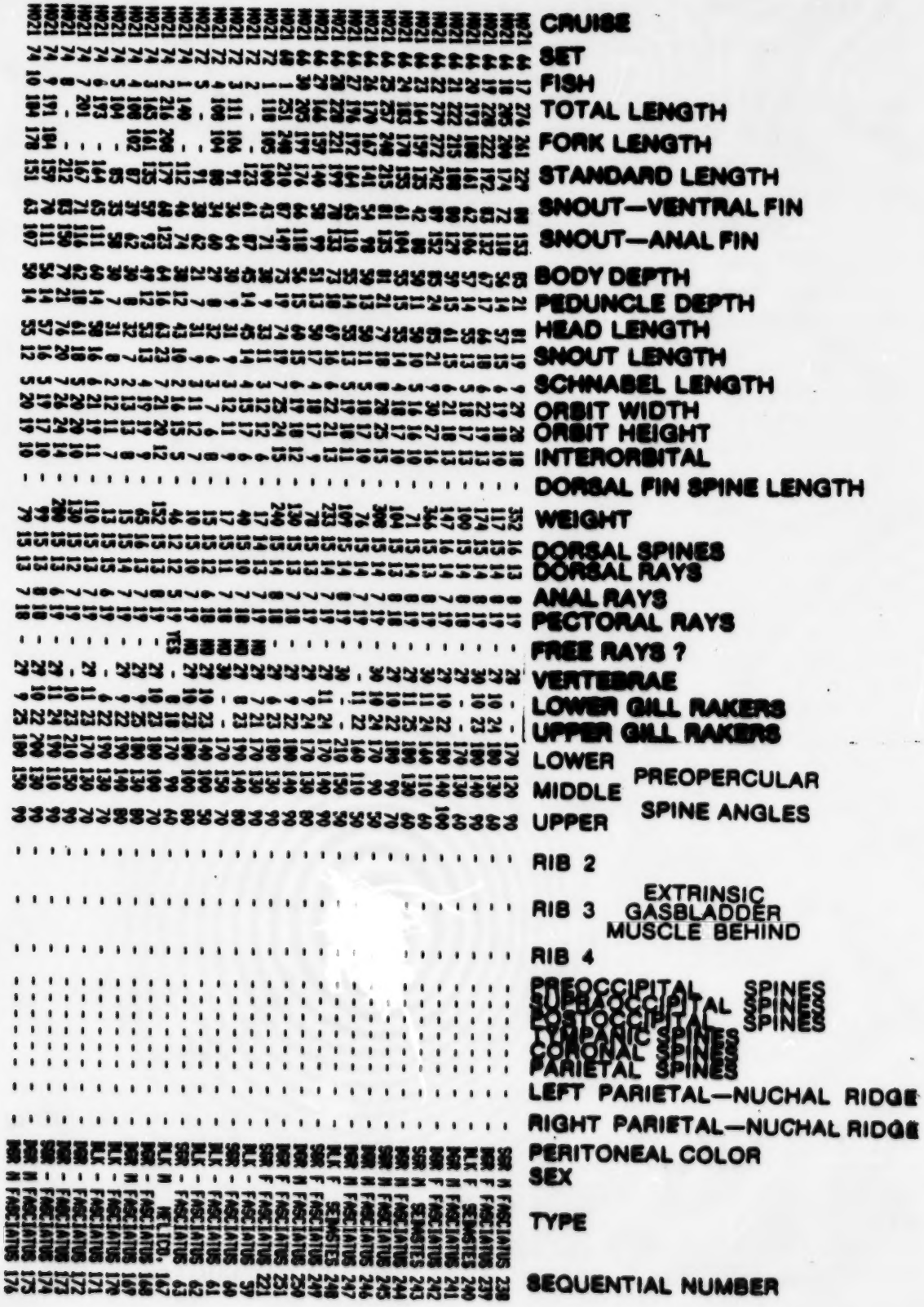
237	SEQUENTIAL NUMBER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RIB 3
EXTRINSIC GASBLADDER MUSCLE BEHIND
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SUPRAOCCIPITAL SPINES
POSTOCCIPITAL SPINES
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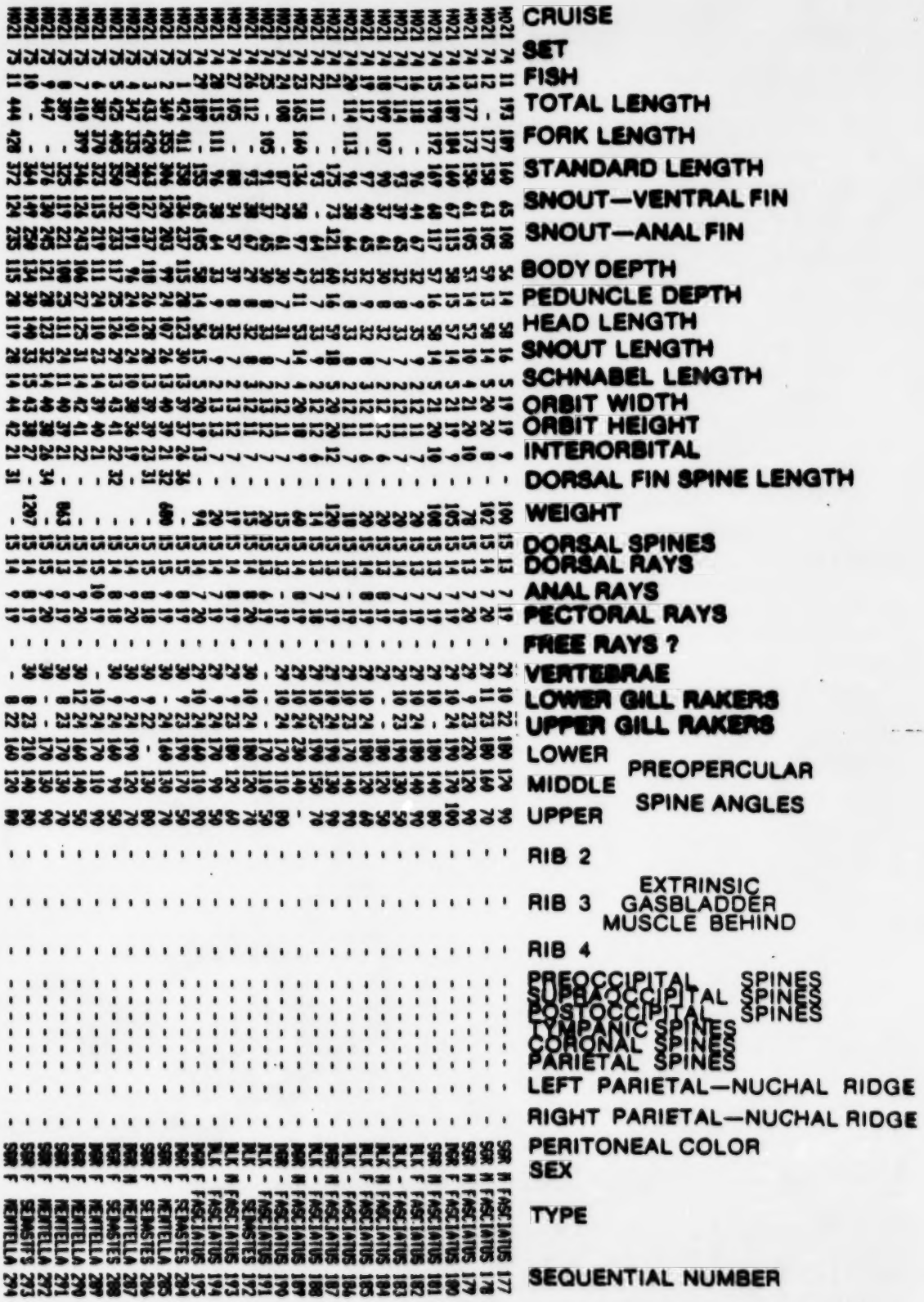
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STANDARD LENGTH
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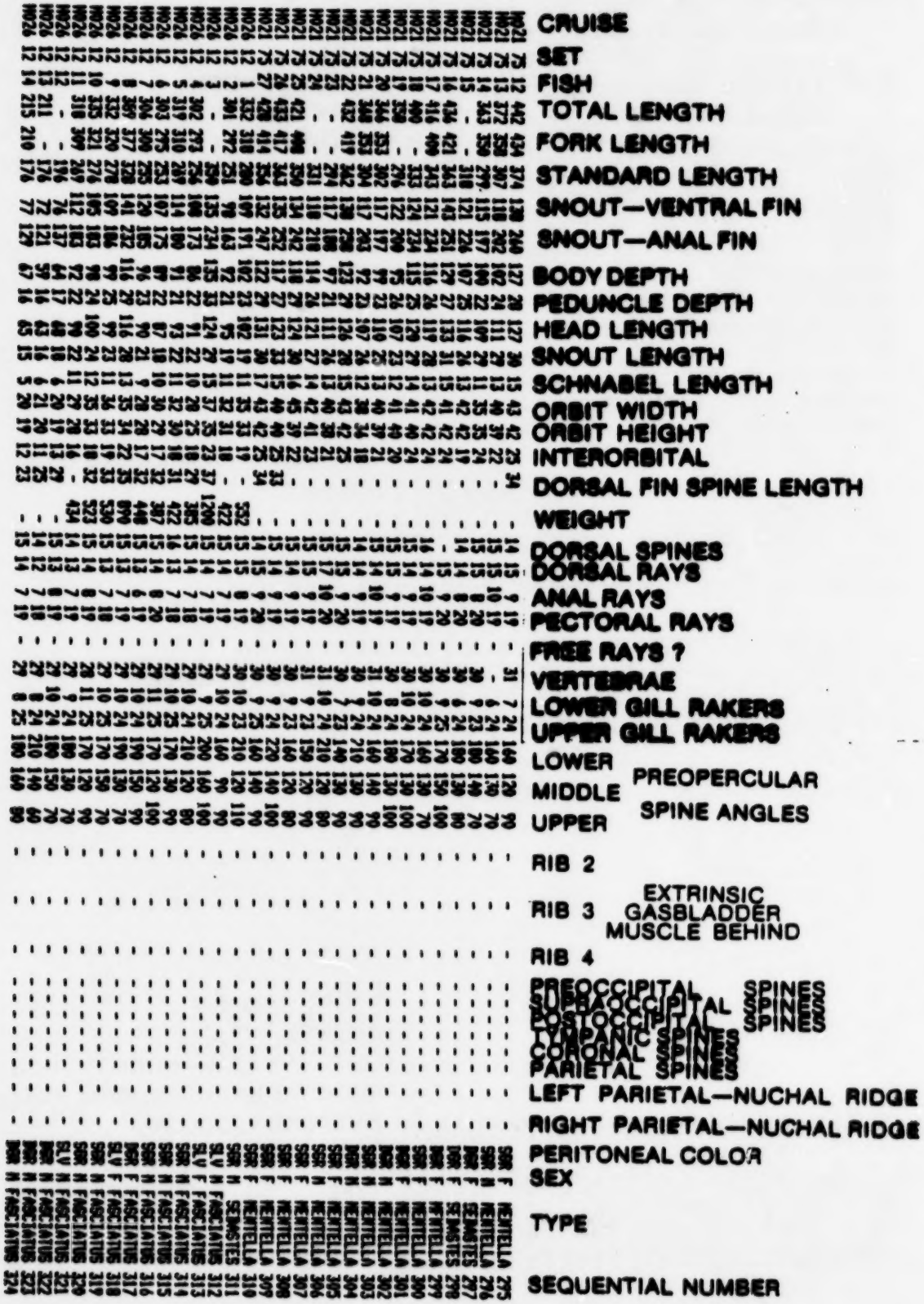
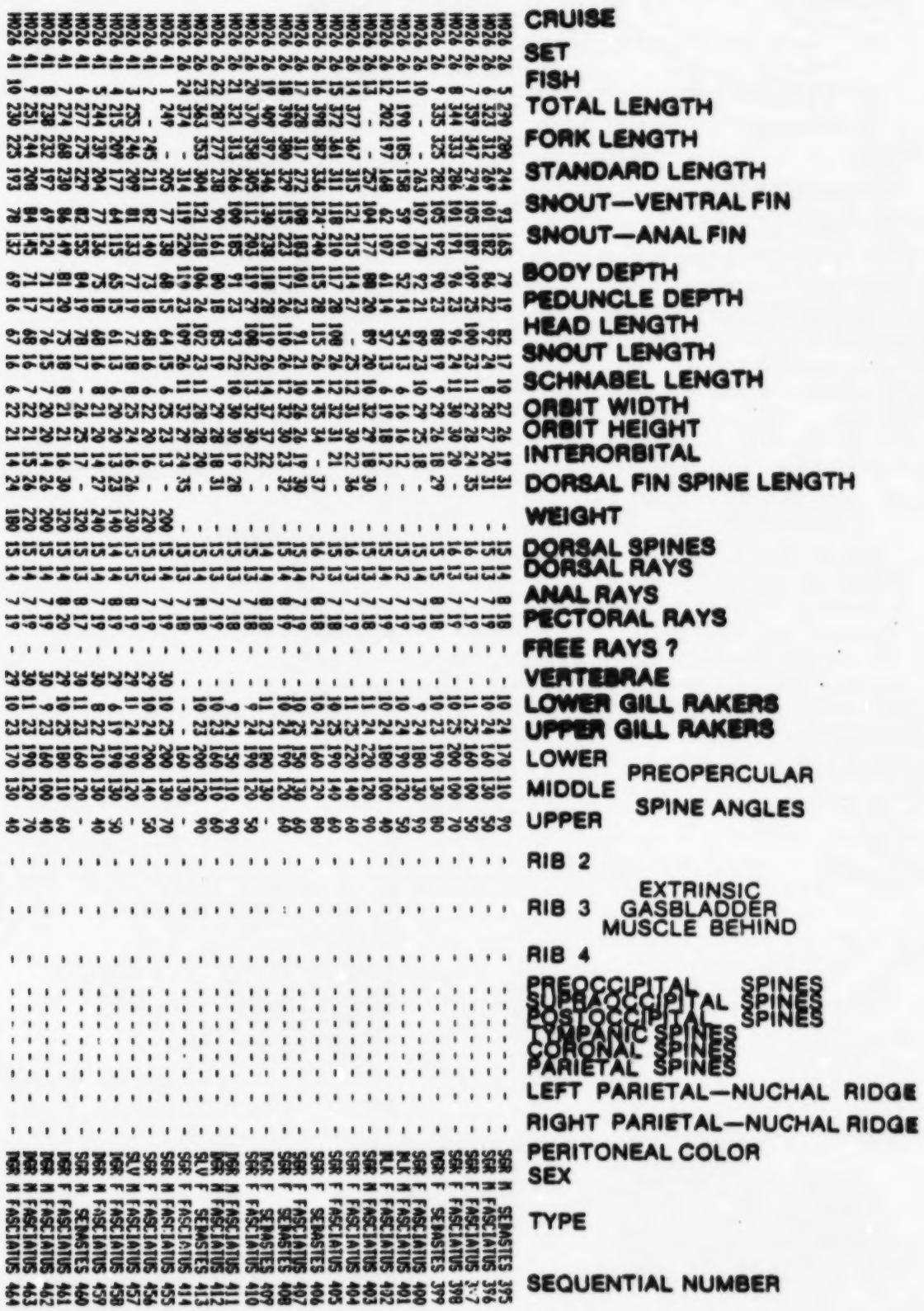
BODY DEPTH
PEDUNCLE DEPTH
HEAD LENGTH
SNOUT LENGTH
SCHNABEL LENGTH
ORBIT WIDTH
ORBIT HEIGHT
INTERORBITAL
DORSAL FIN SPINE LENGTH
WEIGHT
DORSAL SPINES
DORSAL RAYS
ANAL RAYS
PECTORAL RAYS
FREE RAYS ?
VERTEBRAE
LOWER GILL RAKERS
UPPER GILL RAKERS
LOWER
MIDDLE
UPPER
PREOPERCULAR SPINE ANGLES
RIB 2
RIB 3
EXTRINSIC GASBLADDER MUSCLE BEHIND
RIB 4
PREOCCIPITAL SPINES
SUPRAOCCIPITAL SPINES
POSTOCCIPITAL SPINES
TYMPANIC SPINES
CORONAL SPINES
PARIETAL SPINES
LEFT PARIETAL—NUCHAL RIDGE
RIGHT PARIETAL—NUCHAL RIDGE
PERITONEAL COLOR
SEX
TYPE
SEQUENTIAL NUMBER


CRUISE
SET
FISH
TOTAL LENGTH
FORK LENGTH
STANDARD LENGTH
SNOUT—VENTRAL FIN
SNOUT—ANAL FIN
BODY DEPTH
PEDUNCLE DEPTH
HEAD LENGTH
SNOUT LENGTH
SCHNABEL LENGTH
ORBIT WIDTH
ORBIT HEIGHT
INTERORBITAL
DORSAL FIN SPINE LENGTH
WEIGHT
DORSAL SPINES
DORSAL RAYS
ANAL RAYS
PECTORAL RAYS
FREE RAYS ?
VERTEBRAE
LOWER GILL RAKERS
UPPER GILL RAKERS
LOWER
MIDDLE
UPPER
PREOPERCULAR SPINE ANGLES
RIB 2
RIB 3
EXTRINSIC GASBLADDER MUSCLE BEHIND
RIB 4
PREOCCIPITAL SPINES
SUPRAOCCIPITAL SPINES
POSTOCCIPITAL SPINES
TYMPANIC SPINES
CORONAL SPINES
PARIETAL SPINES
LEFT PARIETAL—NUCHAL RIDGE
RIGHT PARIETAL—NUCHAL RIDGE
PERITONEAL COLOR
SEX
TYPE
SEQUENTIAL NUMBER

CRUISE	SET	FISH	TOTAL LENGTH	FORK LENGTH	STANDARD LENGTH	SNOUT—VENTRAL FIN	SNOUT—ANAL FIN	BODY DEPTH	PEDUNCLE DEPTH	HEAD LENGTH	SNOUT LENGTH	SCHNABEL LENGTH	ORBIT WIDTH	ORBIT HEIGHT	INTERORBITAL	DORSAL FIN SPINE LENGTH	WEIGHT	DORSAL SPINES	DORSAL RAYS	ANAL RAYS	PECTORAL RAYS	FREE RAYS ?	VERTEBRAE	LOWER GILL RAKERS	UPPER GILL RAKERS	PREOPERCULAR SPINE ANGLES: LOWER	PREOPERCULAR SPINE ANGLES: MIDDLE	PREOPERCULAR SPINE ANGLES: UPPER	RIB 2	RIB 3 EXTRINSIC GASBLADDER MUSCLE BEHIND	RIB 4	PREOCCIPITAL SPINES	SUPRAOCCIPITAL SPINES	POSTOCCIPITAL SPINES	TYMPANIC SPINES	CORONAL SPINES	PARIETAL SPINES	LEFT PARIETAL—NUCHAL RIDGE	RIGHT PARIETAL—NUCHAL RIDGE	PERITONEAL COLOR	SEX	TYPE	SEQUENTIAL NUMBER
HA26	12	15	207	201	171	94	116	54	15	59	13	6	17	19	6	21	115	14	13	7	7	7	29	10	23	170	136	74	-	-	-	-	-	-	-	-	RLK	M	FASCIATUS	325
HA26	12	16	-	-	141	42	100	51	12	53	11	5	14	18	4	21	69	15	14	7	7	7	29	10	24	180	144	82	-	-	-	-	-	-	-	-	BGR	F	FASCIATUS	326
HA26	12	17	198	-	166	64	115	58	15	61	13	6	20	18	11	22	104	15	14	7	7	7	29	10	21	166	126	80	-	-	-	-	-	-	-	-	BGR	F	FASCIATUS	327
HA26	12	18	334	323	282	110	188	101	24	94	24	11	33	28	8	36	346	15	13	7	8	7	29	10	24	188	148	88	-	-	-	-	-	-	-	-	SGR	M	FASCIATUS	328
HA26	12	19	318	310	266	104	171	95	25	97	27	11	28	25	18	32	448	15	13	7	8	7	29	10	24	180	140	88	-	-	-	-	-	-	-	-	SLV	M	FASCIATUS	329
HA26	12	20	-	343	300	132	204	104	26	104	28	12	33	32	26	39	585	15	14	7	8	7	29	10	23	172	130	84	-	-	-	-	-	-	-	-	BGR	F	FASCIATUS	330
HA26	15	1	315	303	262	100	172	81	22	83	26	10	31	27	16	31	443	15	14	7	8	7	29	10	24	166	120	80	-	-	-	-	-	-	-	-	BGR	F	FASCIATUS	331
HA26	15	2	293	285	242	108	171	81	22	83	26	10	31	27	16	31	443	15	14	7	8	7	29	10	24	166	120	80	-	-	-	-	-	-	-	-	BGR	F	FASCIATUS	332
HA26	15	3	382	369	317	122	214	115	27	113	27	12	35	34	23	34	768	15	13	7	8	7	29	10	23	172	136	84	-	-	-	-	-	-	-	-	BGR	F	FASCIATUS	333
HA26	15	4	352	334	291	110	193	104	24	104	24	11	31	31	18	31	348	15	14	7	8	7	29	10	23	172	134	84	-	-	-	-	-	-	-	-	BGR	F	FASCIATUS	334
HA26	15	5	381	367	316	119	212	111	24	120	24	12	34	34	22	34	625	15	14	7	8	7	29	10	24	180	136	88	-	-	-	-	-	-	-	-	BGR	F	FASCIATUS	335
HA26	15	6	382	371	320	118	211	111	24	120	24	12	34	34	21	34	770	15	14	7	8	7	29	10	24	180	136	88	-	-	-	-	-	-	-	-	SLV	F	FASCIATUS	336
HA26	15	7	362	350	305	114	204	100	28	104	28	11	33	32	22	34	706	15	13	7	8	7	29	10	24	180	136	88	-	-	-	-	-	-	-	-	SGR	F	FASCIATUS	337
HA26	15	8	352	343	297	113	193	94	24	104	24	11	32	32	21	34	648	15	14	7	8	7	29	10	23	172	134	84	-	-	-	-	-	-	-	-	SGR	F	FASCIATUS	338
HA26	15	9	365	354	247	110	193	94	24	104	24	11	32	32	21	34	585	15	14	7	8	7	29	10	24	180	140	88	-	-	-	-	-	-	-	-	SGR	F	FASCIATUS	339
HA26	15	10	385	374	323	132	224	118	29	118	29	12	36	34	23	38	896	15	15	7	8	7	29	10	24	188	144	88	-	-	-	-	-	-	-	-	SGR	F	FASCIATUS	340
HA26	15	11	333	-	276	94	185	94	24	94	24	11	32	32	22	34	410	15	14	7	8	7	29	10	24	180	136	88	-	-	-	-	-	-	-	-	SGR	-	FASCIATUS	341
HA26	15	12	247	234	251	94	170	88	24	94	24	11	32	32	22	34	437	15	14	7	8	7	29	10	24	180	136	88	-	-	-	-	-	-	-	-	SGR	F	FASCIATUS	342
HA26	15	13	315	304	254	94	170	88	24	94	24	11	32	32	22	34	546	15	14	7	8	7	29	10	24	180	136	88	-	-	-	-	-	-	-	-	BGR	M	FASCIATUS	343
HA26	15	14	323	313	271	107	182	94	24	94	24	11	32	32	21	34	520	15	14	7	8	7	29	10	24	180	136	88	-	-	-	-	-	-	-	-	BGR	M	FASCIATUS	344
HA26	15	15	331	-	278	118	185	104	24	104	24	11	32	32	21	34	568	15	14	7	8	7	29	10	24	180	136	88	-	-	-	-	-	-	-	-	SGR	M	FASCIATUS	345
HA26	15	16	333	323	298	104	181	94	24	94	24	11	32	32	21	34	546	15	14	7	8	7	29	10	24	180	136	88	-	-	-	-	-	-	-	-	SGR	F	FASCIATUS	346
HA26	15	17	462	388	337	128	227	118	28	122	28	12	36	35	24	38	1122	15	15	7	8	7	29	10	24	188	144	88	-	-	-	-	-	-	-	-	SLV	F	FASCIATUS	348
HA26	15	18	383	372	320	123	208	116	28	122	28	12	36	35	24	38	1122	15	15	7	8	7	29	10	24	188	144	88	-	-	-	-	-	-	-	-	SGR	F	FASCIATUS	347
HA26	15	19	374	365	317	125	204	116	28	122	28	12	36	35	24	38	1122	15	15	7	8	7	29	10	24	188	144	88	-	-	-	-	-	-	-	-	SLV	F	FASCIATUS	349
HA26	15	20	388	375	325	124	218	114	24	114	24	11	32	32	21	34	546	15	14	7	8	7	29	10	24	188	144	88	-	-	-	-	-	-	-	-	SGR	F	SEMISTES	342
HA26	15	21	216	210	184	110	194	94	24	94	24	11	32	32	21	34	520	15	14	7	8	7	29	10	24	188	144	88	-	-	-	-	-	-	-	-	BGR	-	FASCIATUS	350
HA26	24	2	-	-	269	94	170	88	24	94	24	11	32	32	21	34	546	15	14	7	8	7	29	10	24	188	144	88	-	-	-	-	-	-	-	-	BGR	M	FASCIATUS	351
HA26	24	3	216	-	186	84	120	84	24	94	24	11	32	32	21	34	520	15	14	7	8	7	29	10	24	188	144	88	-	-	-	-	-	-	-	-	BGR	M	FASCIATUS	352
HA26	24	4	303	-	252	94	170	88	24	94	24	11	32	32	21	34	546	15	14	7	8	7	29	10	24	188	144	88	-	-	-	-	-	-	-	-	BGR	M	FASCIATUS	353


CRUISE
SET
FISH
TOTAL LENGTH
FORK LENGTH
STANDARD LENGTH
SNOUT—VENTRAL FIN
SNOUT—ANAL FIN
BODY DEPTH
PEDUNCLE DEPTH
HEAD LENGTH
SNOUT LENGTH
SCHNABEL LENGTH
ORBIT WIDTH
ORBIT HEIGHT
INTERORBITAL
DORSAL FIN SPINE LENGTH
WEIGHT
DORSAL SPINES
DORSAL RAYS
ANAL RAYS
PECTORAL RAYS
FREE RAYS ?
VERTEBRAE
LOWER GILL RAKERS
UPPER GILL RAKERS
LOWER
MIDDLE
UPPER
PREOPERCULAR SPINE ANGLES
RIB 2
RIB 3
EXTRINSIC GASBLADDER MUSCLE BEHIND
RIB 4
PREOCCIPITAL SPINES
SUPRAOCCIPITAL SPINES
POSTOCCIPITAL SPINES
TYMPANIC SPINES
CORONAL SPINES
PARIETAL SPINES
LEFT PARIETAL—NUCHAL RIDGE
RIGHT PARIETAL—NUCHAL RIDGE
PERITONEAL COLOR
SEX
TYPE
SEQUENTIAL NUMBER

HA26	CRUISE
41	SET
11	FISH
.	TOTAL LENGTH
302	FORK LENGTH
245	STANDARD LENGTH
210	SNOUT—VENTRAL FIN
254	SNOUT—ANAL FIN
194	BODY DEPTH
146	PEDUNCLE DEPTH
91	HEAD LENGTH
21	SNOUT LENGTH
65	SCHNABEL LENGTH
21	ORBIT WIDTH
9	ORBIT HEIGHT
24	INTERORBITAL
25	DORSAL FIN SPINE LENGTH
18	WEIGHT
14	DORSAL SPINES
460	DORSAL RAYS
15	ANAL RAYS
14	PECTORAL RAYS
7	FREE RAYS ?
19	VERTEBRAE
-	LOWER GILL RAKERS
-	UPPER GILL RAKERS
29	LOWER
11	MIDDLE
25	UPPER
210	PREOPERCULAR SPINE ANGLES
130	
60	
-	RIB 2
-	RIB 3 EXTRINSIC GASBLADDER MUSCLE BEHIND
-	RIB 4
-	PREOCCIPITAL SPINES
-	SUPRAOCCIPITAL SPINES
-	POSTOCCIPITAL SPINES
-	TYMPANIC SPINES
-	CORONAL SPINES
-	PARIETAL SPINES
-	LEFT PARIETAL—NUCHAL RIDGE
-	RIGHT PARIETAL—NUCHAL RIDGE
DGR	PERITONEAL COLOR
F	SEX
FASCIATUS	TYPE
465	SEQUENTIAL NUMBER
DGR	
F	
SEMISTES	
466	
DGR	
F	
SEMISTES	
467	
SGR	
M	
FASCIATUS	
468	
SGR	
F	
FASCIATUS	
469	
SGR	
F	
FASCIATUS	
470	
DGR	
M	
FASCIATUS	
471	
DGR	
M	
FASCIATUS	
472	
SGR	
F	
FASCIATUS	
473	
SGR	
F	
FASCIATUS	
474	
SGR	
M	
FASCIATUS	
475	
DGR	
M	
FASCIATUS	
476	
DGR	
M	
FASCIATUS	
477	
DGR	
M	
FASCIATUS	
478	
DGR	
M	
FASCIATUS	
479	
DGR	
M	
FASCIATUS	
480	
DGR	
M	
FASCIATUS	
351	
SGR	
M	
FASCIATUS	
352	
DGR	
F	
FASCIATUS	
353	
DGR	
F	
FASCIATUS	
354	
BLK	
M	
FASCIATUS	
355	
BLK	
M	
MENTELLA	
356	
BLK	
F	
FASCIATUS	
357	
BLK	
M	
FASCIATUS	
358	
BLK	
M	
FASCIATUS	
359	
SGR	
M	
FASCIATUS	
360	
SGR	
M	
FASCIATUS	
361	
BLK	
M	
FASCIATUS	
362	
DGR	
M	
SEMISTES	
363	
SGR	
M	
FASCIATUS	
364	

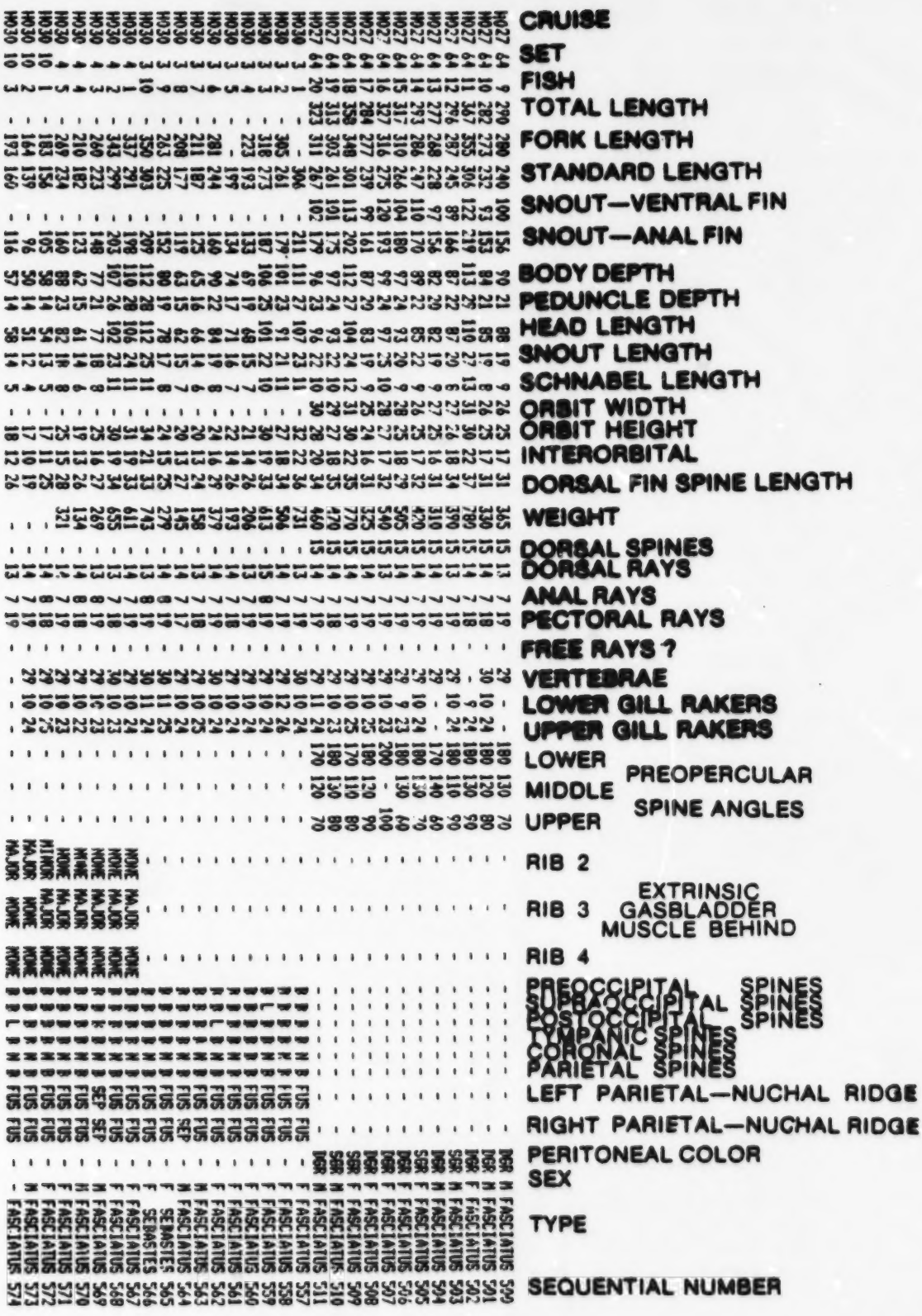
CRUISE	SET	FISH	TOTAL LENGTH	FORK LENGTH	STANDARD LENGTH	SNOUT—VENTRAL FIN	SNOUT—ANAL FIN	BODY DEPTH	PEDUNCLE DEPTH	HEAD LENGTH	SNOUT LENGTH	SCHNABEL LENGTH	ORBIT WIDTH	ORBIT HEIGHT	INTERORBITAL	DORSAL FIN SPINE LENGTH	WEIGHT	DORSAL SPINES	DORSAL RAYS	ANAL RAYS	PECTORAL RAYS	FREE RAYS ?	VERTEBRAE	LOWER GILL RAKERS	UPPER GILL RAKERS	PREOPERCULAR SPINE ANGLES: LOWER	PREOPERCULAR SPINE ANGLES: MIDDLE	PREOPERCULAR SPINE ANGLES: UPPER	RIB 2	RIB 3 (EXTRINSIC GASBLADDER MUSCLE BEHIND)	RIB 4	PREOCCIPITAL SPINES	SUPRAOCCIPITAL SPINES	POSTOCCIPITAL SPINES	TYMPANIC SPINES	CORONAL SPINES	PARIETAL SPINES	LEFT PARIETAL—NUCHAL RIDGE	RIGHT PARIETAL--NUCHAL RIDGE	PERITONEAL COLOR	SEX	TYPE	SEQUENTIAL NUMBER
H026	53	15	313	308	260	99	178	91	22	91	21	9	29	29	20	31	441	16	13	7	18	-	30	11	24	180	130	70											DGR	M	FASCIATUS	365
H026	55	16	278	288	249	89	166	87	20	87	19	10	28	27	18	30	372	15	13	8	19	-	30	11	24	160	120	60											SGR	M	SEBASTES	366
H026	53	17	237	227	196	73	127	65	17	65	16	7	22	21	14	25	187	15	14	8	19	-	29	10	24	170	130	60											BLK	F	FASCIATUS	367
H026	55	18	212	205	178	66	118	60	15	60	13	5	19	19	11	24	147	15	13	7	18	-	29	10	24	180	140	-											BLK	M	FASCIATUS	368
H026	55	19	-	-	-	62	102	50	11	56	13	5	18	18	9	19	80	15	14	8	20	-	30	10	25	-	110	60											BLK	M	SEBASTES	369
H026	55	20	199	-	165	63	103	58	14	58	13	5	20	18	12	25	-	15	13	7	18	-	29	10	23	160	100	60											BLK	M	FASCIATUS	370
H026	57	1	213	-	173	64	116	54	14	59	12	6	19	18	12	23	-	15	14	7	19	-	29	11	25	180	130	70											DGR	F	FASCIATUS	415
H026	57	2	350	336	293	109	196	94	23	102	24	13	34	34	21	31	-	15	14	8	19	-	30	11	25	195	140	90											DGR	F	MENTELLA	416
H026	57	3	313	-	260	98	173	78	20	89	23	9	29	27	19	28	-	15	14	9	19	-	30	8	24	200	150	70											SGR	F	FASCIATUS	417
H026	57	4	381	345	314	120	202	105	25	112	25	13	35	35	24	33	-	15	14	7	18	-	30	11	24	160	140	80											DGR	M	MENTELLA	418
H026	57	5	338	326	282	104	192	90	22	98	21	10	34	30	19	33	-	15	13	8	19	-	30	10	23	200	150	80											DGR	M	MENTELLA	419
H026	57	6	343	338	287	110	197	93	26	104	23	10	38	36	22	-	-	15	13	8	19	-	30	10	23	190	140	80											DGR	M	SEBASTES	420
H026	57	7	388	-	323	124	219	105	26	118	28	-	38	34	24	-	-	15	14	8	19	-	30	11	24	180	140	80											SGR	F	MENTELLA	421
H026	57	8	-	-	367	117	193	98	25	110	27	12	43	41	26	32	-	15	14	9	20	-	30	11	23	180	130	80											DGR	F	MENTELLA	422
H026	57	9	342	331	280	111	187	93	25	103	24	11	37	34	25	33	-	15	13	9	19	-	30	11	23	160	130	70											DGR	M	SEBASTES	423
H026	57	10	330	318	272	105	174	93	25	103	24	11	35	33	19	31	-	15	13	9	20	-	30	11	24	170	140	70											DGR	M	MENTELLA	424
H026	57	11	343	331	280	112	189	100	25	108	25	12	35	33	22	32	-	15	14	8	19	-	30	10	25	210	160	80											SGR	M	SEBASTES	425
H026	57	12	366	353	306	125	204	100	25	108	25	12	38	33	22	-	-	15	14	8	19	-	30	10	23	170	140	70											SGR	M	SEBASTES	426
H026	57	13	-	363	307	122	206	105	24	112	23	13	41	40	18	-	-	15	14	8	19	-	30	10	23	170	140	70											DGR	M	SEBASTES	427
H026	57	14	394	380	329	129	227	107	27	116	29	12	36	35	24	32	-	15	14	8	19	-	30	10	24	190	140	80											SGR	F	SEBASTES	428
H026	57	15	-	342	290	118	198	100	24	110	26	11	37	34	22	-	-	15	14	8	19	-	30	10	24	190	130	70											DGR	M	MENTELLA	429
H026	57	16	-	-	287	108	185	101	25	105	23	11	35	33	22	34	-	15	14	8	19	-	30	11	24	200	140	70											DGR	M	SEBASTES	430
H026	57	17	363	351	299	118	193	100	26	108	25	12	36	34	24	33	-	15	14	8	19	-	30	11	24	200	140	70											DGR	M	SEBASTES	431
H026	57	18	362	350	300	104	197	94	23	102	24	13	34	34	21	31	-	15	14	9	19	-	30	11	24	180	120	90											DGR	M	SEBASTES	432
H026	57	19	365	352	302	117	196	97	26	109	26	11	36	34	21	33	-	15	14	8	19	-	30	11	24	180	140	80											DGR	M	SEBASTES	433
H026	57	20	356	344	283	109	188	100	26	112	25	12	34	34	22	34	-	15	14	8	18	-	30	-	-	-	-	-											DGR	M	SEBASTES	434
H026	57	1	241	231	202	78	-	72	16	72	19	8	23	22	15	23	191	15	14	8	18	-	30	10	25	180	120	40											DGR	M	MENTELLA	371
H026	59	2	365	352	303	129	195	104	25	110	27	12	35	36	22	31	611	15	14	9	20	-	30	-	22	180	140	70											DGR	M	MENTELLA	372
H026	59	3	370	356	308	129	201	105	27	115	24	13	35	35	22	35	627	15	16	7	20	-	30	7	24	180	140	70											DGR	M	FASCIATUS	373
H026	59	4	390	367	313	121	203	109	27	118	24	12	41	39	20	-	722	-	15	10	20	-	30	9	24	220	140	90											SGR	M	MENTELLA	374

CRUISE	SET	FISH	TOTAL LENGTH	FORK LENGTH	STANDARD LENGTH	SNOUT—VENTRAL FIN	SNOUT—ANAL FIN	BODY DEPTH	PEDUNCLE DEPTH	HEAD LENGTH	SNOUT LENGTH	SCHNABEL LENGTH	ORBIT WIDTH	ORBIT HEIGHT	INTERORBITAL	DORSAL FIN SPINE LENGTH	WEIGHT	DORSAL SPINES	DORSAL RAYS	ANAL RAYS	PECTORAL RAYS	FREE RAYS ?	VERTEBRAE	LOWER GILL RAKERS	UPPER GILL RAKERS	PREOPERCULAR SPINE ANGLES: LOWER	PREOPERCULAR SPINE ANGLES: MIDDLE	PREOPERCULAR SPINE ANGLES: UPPER	RIB 2	RIB 3	RIB 4	PREOCCIPITAL SPINES	SUPRAOCCIPITAL SPINES	POSTOCCIPITAL SPINES	TYMPANIC SPINES	CORONAL SPINES	PARIETAL SPINES	LEFT PARIETAL—NUCHAL RIDGE	RIGHT PARIETAL—NUCHAL RIDGE	PERITONEAL COLOR	SEX	TYPE	SEQUENTIAL NUMBER
H026	59	5	404	393	334	131	229	110	24	119	29	26	14	37	37	25	25	-	35	817	15	14	8	20	-	30	9	23	180	130	90	70	-	-	-	-	-	-	-	-	-	SGR F	SERASTES	375
H026	59	6	397	382	326	128	220	112	25	122	29	16	43	41	25	25	-	18	28	735	15	15	8	19	9	-	8	23	180	140	70	50	-	-	-	-	-	-	-	-	-	DGR M	SERASTES	376
H026	59	7	308	289	254	99	168	85	20	93	21	9	26	26	18	24	36	36	33	369	15	15	8	19	9	-	11	24	190	150	90	50	-	-	-	-	-	-	-	-	-	RLK M	MENTELLA	377
H026	59	8	402	387	328	124	222	113	28	120	29	14	35	36	24	24	33	33	36	806	15	14	8	19	-	30	8	24	180	140	90	70	-	-	-	-	-	-	-	-	-	SGR F	SERASTES	379
H026	59	9	-	-	-	-	-	117	26	118	29	13	39	37	24	25	-	33	-	832	14	15	8	19	-	-	9	24	190	140	70	50	-	-	-	-	-	-	-	-	-	SGR F	SERASTES	378
H026	59	10	-	-	-	-	-	117	25	133	29	16	46	44	25	-	33	-	-	943	14	13	8	19	-	-	9	23	180	150	70	50	-	-	-	-	-	-	-	-	-	SGR M	SERASTES	380
H026	59	11	397	385	330	127	225	111	26	120	27	13	37	36	26	23	-	33	20	771	15	13	8	19	-	30	8	25	210	150	90	70	-	-	-	-	-	-	-	-	-	DGR F	SERASTES	381
H026	59	12	364	351	302	134	198	108	25	108	27	13	37	36	24	23	-	33	20	617	15	15	8	19	-	30	10	25	200	170	100	70	-	-	-	-	-	-	-	-	-	DGR M	SERASTES	382
H026	59	13	370	360	311	124	211	95	25	110	27	12	36	35	20	33	-	33	-	594	12	14	8	19	-	30	10	25	190	150	90	70	-	-	-	-	-	-	-	-	-	DGR M	SERASTES	383
H026	59	14	406	392	336	138	231	116	28	121	29	14	40	39	24	35	-	33	-	920	15	14	9	19	-	30	9	24	200	160	90	70	-	-	-	-	-	-	-	-	-	DGR F	MENTELLA	384
H026	59	15	391	376	322	122	227	113	26	117	27	-	38	37	26	34	-	35	-	825	15	14	7	19	-	30	9	23	180	140	90	70	-	-	-	-	-	-	-	-	-	SGR F	FASCIATUS	385
H026	59	16	405	389	332	131	226	115	27	122	29	13	40	39	25	-	33	-	-	835	15	14	9	19	-	31	10	25	220	170	90	80	-	-	-	-	-	-	-	-	-	SGR M	MENTELLA	386
H026	59	17	417	-	345	143	245	112	25	120	31	13	38	36	23	33	-	35	-	959	14	14	8	19	-	31	9	23	190	130	90	70	-	-	-	-	-	-	-	-	-	DGR F	SERASTES	387
H026	59	18	411	396	341	140	227	116	27	122	31	13	37	35	24	34	-	35	-	1074	15	15	8	19	-	30	10	24	180	130	90	70	-	-	-	-	-	-	-	-	-	SGR F	SERASTES	388
H026	59	19	415	375	334	135	227	118	28	122	31	16	43	41	25	35	-	35	-	959	15	14	8	19	-	30	9	24	180	140	90	70	-	-	-	-	-	-	-	-	-	DGR M	FASCIATUS	389
H026	59	20	432	415	362	139	245	122	30	126	32	13	37	37	25	35	-	35	-	1074	15	15	8	19	-	31	10	24	190	140	90	70	-	-	-	-	-	-	-	-	-	DGR F	MENTELLA	390
H027	34	1	215	208	180	69	118	64	16	66	14	6	24	23	12	26	-	33	-	590	15	14	8	19	-	29	10	25	190	130	90	70	-	-	-	-	-	-	-	-	-	DGR F	FASCIATUS	435
H027	34	2	192	184	158	62	106	53	13	57	12	5	21	20	10	23	-	33	-	590	15	15	8	19	-	29	10	25	190	130	90	70	-	-	-	-	-	-	-	-	-	DGR M	FASCIATUS	436
H027	34	3	252	245	212	89	144	76	18	76	17	7	25	24	14	28	-	33	-	830	15	15	8	19	-	29	10	24	200	140	90	70	-	-	-	-	-	-	-	-	-	SGR F	FASCIATUS	437
H027	34	4	-	-	260	223	179	86	153	75	20	77	17	7	23	23	15	28	-	270	15	13	7	19	-	29	9	23	180	120	90	70	-	-	-	-	-	-	-	-	-	DGR F	FASCIATUS	438
H027	34	5	-	-	-	-	-	77	129	62	14	64	14	7	22	20	12	20	-	120	15	12	6	19	-	29	8	23	180	120	90	70	-	-	-	-	-	-	-	-	-	DGR M	FASCIATUS	439
H027	34	6	237	230	198	76	132	71	15	69	15	7	24	24	13	26	-	33	-	180	15	13	7	19	-	29	9	25	170	120	90	70	-	-	-	-	-	-	-	-	-	SGR M	FASCIATUS	440
H027	34	7	246	237	206	84	137	74	18	75	17	8	26	25	13	28	-	33	-	230	15	14	7	18	-	29	10	24	190	120	90	70	-	-	-	-	-	-	-	-	-	DGR F	FASCIATUS	441
H027	34	8	217	208	180	69	117	64	15	62	13	6	20	19	13	27	-	33	-	270	15	13	7	19	-	29	10	25	190	140	90	70	-	-	-	-	-	-	-	-	-	DGR M	FASCIATUS	442
H027	34	9	250	240	208	80	138	75	18	73	15	5	24	24	14	27	-	33	-	100	15	14	8	19	-	29	10	24	180	140	90	70	-	-	-	-	-	-	-	-	-	SGR F	FASCIATUS	443
H027	34	10	195	189	162	64	108	59	14	57	15	5	22	20	12	22	-	33	-	70	15	13	7	19	-	29	10	25	180	-	90	70	-	-	-	-	-	-	-	-	-	DGR M	FASCIATUS	444
H027	34	11	171	165	141	52	93	49	12	50	12	5	18	17	10	21	-	33	-	540	15	13	7	19	-	29	10	25	180	140	90	70	-	-	-	-	-	-	-	-	-	DGR M	FASCIATUS	445
H027	34	12	335	334	280	103	182	94	24	93	24	11	30	28	18	36	-	35	-	970	15	13	7	19	-	29	10	24	190	140	90	80	-	-	-	-	-	-	-	-	-	DGR F	FASCIATUS	446
H027	34	13	179	173	151	61	99	54	13	55	13	4	20	19	9	19	-	35	-	700	15	13	7	19	-	29	10	24	180	140	90	80	-	-	-	-	-	-	-	-	-	DGR M	FASCIATUS	447
H027	34	14	270	260	221	89	150	84	20	80	18	8	26	24	14	25	-	35	-	1074	15	15	8	19	-	29	10	24	180	140	90	80	-	-	-	-	-	-	-	-	-	DGR M	FASCIATUS	448

CRUISE	H027
SET	H027
FISH	H027
TOTAL LENGTH	H027
FORK LENGTH	H027
STANDARD LENGTH	H027
SNOUT—VENTRAL FIN	H027
SNOUT—ANAL FIN	H027
BODY DEPTH	H027
PEDUNCLE DEPTH	H027
HEAD LENGTH	H027
SNOUT LENGTH	H027
SCHNABEL LENGTH	H027
ORBIT WIDTH	H027
ORBIT HEIGHT	H027
INTERORBITAL	H027
DORSAL FIN SPINE LENGTH	H027
WEIGHT	H027
DORSAL SPINES	H027
DORSAL RAYS	H027
ANAL RAYS	H027
PECTORAL RAYS	H027
FREE RAYS ?	H027
VERTEBRAE	H027
LOWER GILL RAKERS	H027
UPPER GILL RAKERS	H027
LOWER	H027
MIDDLE PREOPERCULAR	H027
UPPER SPINE ANGLES	H027
RIB 2	H027
RIB 3 EXTRINSIC GASBLADDER MUSCLE BEHIND	H027
RIB 4	H027
PREOCCIPITAL SPINES	H027
SUBPAROCCIPITAL SPINES	H027
POSTOCCIPITAL SPINES	H027
TYMPANIC SPINES	H027
CORONAL SPINES	H027
PARIETAL SPINES	H027
LEFT PARIETAL—NUCHAL RIDGE	H027
RIGHT PARIETAL—NUCHAL RIDGE	H027
PERITONEAL COLOR	H027
SEX	H027
TYPE	H027
SEQUENTIAL NUMBER	H027

CRUISE	SET	FISH	TOTAL LENGTH	FORK LENGTH	STANDARD LENGTH	SNOUT—VENTRAL FIN	SNOUT—ANAL FIN	BODY DEPTH	PEDUNCLE DEPTH	HEAD LENGTH	SNOUT LENGTH	SCHNABEL LENGTH	ORBIT WIDTH	ORBIT HEIGHT	INTERORBITAL	DORSAL FIN SPINE LENGTH	WEIGHT	DORSAL SPINES	DORSAL RAYS	ANAL RAYS	PECTORAL RAYS	FREE RAYS ?	VERTEBRAE	LOWER GILL RAKERS	UPPER GILL RAKERS	PREOPERCULAR SPINE ANGLES: LOWER	PREOPERCULAR SPINE ANGLES: MIDDLE	PREOPERCULAR SPINE ANGLES: UPPER	RIB 2	RIB 3 (EXTRINSIC GASBLADDER MUSCLE BEHIND)	RIB 4	PREOCCIPITAL SPINES	SUPRAOCCIPITAL SPINES	POSTOCCIPITAL SPINES	TYMPANIC SPINES	CORONAL SPINES	PARIETAL SPINES	LEFT PARIETAL—NUCHAL RIDGE	RIGHT PARIETAL—NUCHAL RIDGE	PERITONEAL COLOR	SEX	TYPE	SEQUENTIAL NUMBER
H027	58	6	330	320	270	108	180	101	23	101	22	13	35	33	18	32	535	15	14	7	18	-	29	11	23	170	130	90	-	-	-	-	-	-	-	-	-	-	SGR	M	FASCIATUS	486
H027	58	7	325	314	267	103	179	104	23	-	23	10	29	29	19	33	620	15	14	7	19	-	-	10	25	-	-	-	-	-	-	-	-	-	-	-	-	SGR	F	FASCIATUS	487
H027	58	8	434	423	367	134	247	138	30	127	26	14	38	37	24	34	1250	15	13	7	17	-	-	10	23	160	110	70	-	-	-	-	-	-	-	-	-	-	SGR	F	SERRASTES	488
H027	58	9	362	350	298	122	211	112	26	106	24	11	32	36	21	34	720	15	14	7	19	-	-	11	23	160	110	70	-	-	-	-	-	-	-	-	-	-	SGR	F	FASCIATUS	489
H027	58	10	332	321	274	115	185	103	22	99	23	10	33	33	19	35	560	15	13	7	19	-	29	11	25	180	130	90	-	-	-	-	-	-	-	-	-	-	SLV	M	FASCIATUS	490
H027	58	11	315	306	264	117	183	98	24	93	21	8	28	27	18	31	570	16	13	7	19	-	29	11	25	-	-	-	-	-	-	-	-	-	-	-	-	SGR	F	FASCIATUS	491
H027	61	1	376	363	316	126	218	115	27	112	26	14	32	32	21	35	910	14	14	7	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	SGR	F	FASCIATUS	512
H027	61	2	273	266	228	92	151	89	22	83	19	8	25	24	19	27	370	15	12	7	19	-	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	SGR	F	FASCIATUS	513
H027	61	3	387	372	324	127	217	125	28	117	26	13	34	34	22	32	940	15	14	7	19	-	29	11	24	170	140	100	-	-	-	-	-	-	-	-	-	-	SGR	F	FASCIATUS	514
H027	61	4	374	344	310	118	210	124	30	115	25	13	35	33	23	37	960	15	13	7	20	-	29	11	25	158	120	70	-	-	-	-	-	-	-	-	-	-	DGR	F	FASCIATUS	515
H027	61	5	378	346	312	126	213	118	27	115	25	14	38	33	22	35	840	15	13	7	19	-	29	11	24	188	136	90	-	-	-	-	-	-	-	-	-	-	SGR	F	FASCIATUS	516
H027	61	6	371	358	307	117	220	111	29	107	24	12	33	33	22	33	870	15	13	8	18	-	29	10	24	188	136	90	-	-	-	-	-	-	-	-	-	-	SLV	F	FASCIATUS	517
H027	61	7	380	346	316	117	204	123	29	113	24	14	35	34	24	34	1000	14	13	7	19	-	29	10	24	188	136	90	-	-	-	-	-	-	-	-	-	-	SGR	F	FASCIATUS	518
H027	61	8	372	359	310	125	215	119	28	98	23	11	34	33	21	33	880	15	14	7	18	-	29	11	24	188	136	90	-	-	-	-	-	-	-	-	-	-	SLV	M	FASCIATUS	519
H027	61	9	372	359	310	125	215	119	28	98	23	11	34	33	21	33	880	15	14	7	19	-	29	10	24	188	136	90	-	-	-	-	-	-	-	-	-	-	SGR	F	FASCIATUS	520
H027	61	10	383	367	312	121	212	121	26	114	22	13	36	35	21	34	930	15	13	8	18	-	29	10	24	188	136	90	-	-	-	-	-	-	-	-	-	-	SGR	F	FASCIATUS	521
H027	61	11	384	370	315	117	217	117	28	114	26	14	35	35	23	36	880	15	13	7	19	-	29	-	-	170	110	70	-	-	-	-	-	-	-	-	-	-	SGR	F	FASCIATUS	522
H027	61	12	331	320	273	101	178	105	24	102	22	12	33	33	22	33	650	15	13	7	18	-	29	11	24	170	110	70	-	-	-	-	-	-	-	-	-	-	SLV	F	FASCIATUS	523
H027	61	13	344	352	303	118	199	112	24	111	24	12	34	34	21	32	800	15	13	7	19	-	29	11	25	180	130	90	-	-	-	-	-	-	-	-	-	-	SLV	F	FASCIATUS	524
H027	61	14	374	363	309	118	211	112	26	96	24	11	32	33	21	33	880	15	13	7	19	-	29	11	25	180	130	90	-	-	-	-	-	-	-	-	-	-	SLV	F	FASCIATUS	525
H027	61	15	324	313	264	101	183	94	24	93	21	10	31	32	20	32	570	15	13	7	19	-	29	11	25	180	130	90	-	-	-	-	-	-	-	-	-	-	SLV	M	FASCIATUS	526
H027	61	16	335	324	280	104	182	100	24	94	21	11	31	33	20	32	570	15	13	7	19	-	29	11	25	180	130	90	-	-	-	-	-	-	-	-	-	-	SLV	M	FASCIATUS	527
H027	64	1	242	235	201	77	139	69	18	72	18	7	22	21	15	26	220	15	13	7	18	-	29	10	23	170	110	70	-	-	-	-	-	-	-	-	-	-	SGR	F	FASCIATUS	512
H027	64	2	389	376	329	125	220	123	27	114	27	13	32	32	22	34	920	15	13	7	19	-	29	11	24	170	110	70	-	-	-	-	-	-	-	-	-	-	SGR	F	FASCIATUS	513
H027	64	3	389	376	329	125	220	123	27	114	27	13	32	32	22	34	920	15	13	7	19	-	29	11	24	170	110	70	-	-	-	-	-	-	-	-	-	-	SGR	F	FASCIATUS	514
H027	64	4	244	237	202	78	134	73	17	73	17	7	23	23	14	25	540	15	13	7	19	-	29	11	24	170	110	70	-	-	-	-	-	-	-	-	-	-	SGR	F	FASCIATUS	515
H027	64	5	322	312	269	110	179	97	23	93	21	9	27	26	19	32	530	15	13	7	19	-	29	11	24	170	110	70	-	-	-	-	-	-	-	-	-	-	SGR	F	FASCIATUS	516
H027	64	6	261	253	214	83	143	73	20	77	17	7	24	23	14	28	260	15	13	7	19	-	29	10	24	188	136	90	-	-	-	-	-	-	-	-	-	-	SGR	F	FASCIATUS	517
H027	64	7	303	295	246	111	174	94	22	90	20	9	26	25	17	32	470	15	13	7	19	-	29	10	24	188	136	90	-	-	-	-	-	-	-	-	-	-	SGR	M	FASCIATUS	518
H027	64	8	313	304	260	96	171	94	22	94	21	9	26	25	19	32	450	15	15	7	19	-	30	10	24	170	130	90	-	-	-	-	-	-	-	-	-	-	SGR	M	FASCIATUS	499

PREOPERCULAR SPINE ANGLES
EXTRINSIC GASBLADDER MUSCLE BEHIND


CRUISE
SET
FISH
TOTAL LENGTH
FORK LENGTH
STANDARD LENGTH
SNOUT—VENTRAL FIN
SNOUT—ANAL FIN
BODY DEPTH
PEDUNCLE DEPTH
HEAD LENGTH
SNOUT LENGTH
SCHNABEL LENGTH
ORBIT WIDTH
ORBIT HEIGHT
INTERORBITAL
DORSAL FIN SPINE LENGTH
WEIGHT
DORSAL SPINES
DORSAL RAYS
ANAL RAYS
PECTORAL RAYS
FREE RAYS ?
VERTEBRAE
LOWER GILL RAKERS
UPPER GILL RAKERS
PREOPERCULAR SPINE ANGLES
LOWER
MIDDLE
UPPER
RIB 2
RIB 3
EXTRINSIC GASBLADDER MUSCLE BEHIND
RIB 4
PREOCCIPITAL SPINES
SUPRAOCCIPITAL SPINES
POSTOCCIPITAL SPINES
TYMPANIC SPINES
CORONAL SPINES
PARIETAL SPINES
LEFT PARIETAL—NUCHAL RIDGE
RIGHT PARIETAL—NUCHAL RIDGE
PERITONEAL COLOR
SEX
TYPE
SEQUENTIAL NUMBER

CRUISE	SET	FISH	TOTAL LENGTH	FORK LENGTH	STANDARD LENGTH	SNOUT—VENTRAL FIN	SNOUT—ANAL FIN	BODY DEPTH	PEDUNCLE DEPTH	HEAD LENGTH	SNOUT LENGTH	SCHNABEL LENGTH	ORBIT WIDTH	ORBIT HEIGHT	INTERORBITAL	DORSAL FIN SPINE LENGTH	WEIGHT	DORSAL SPINES	DORSAL RAYS	ANAL RAYS	PECTORAL RAYS	FREE RAYS ?	VERTEBRAE	LOWER GILL RAKERS	UPPER GILL RAKERS	PREOPERCULAR SPINE ANGLES: LOWER	PREOPERCULAR SPINE ANGLES: MIDDLE	PREOPERCULAR SPINE ANGLES: UPPER	RIB 2	RIB 3 (EXTRINSIC GASBLADDER MUSCLE BEHIND)	RIB 4	PREOCCIPITAL SPINES	SUPRAOCCIPITAL SPINES	POSTOCCIPITAL SPINES	TYMPANIC SPINES	CORONAL SPINES	PARIETAL SPINES	LEFT PARIETAL—NUCHAL RIDGE	RIGHT PARIETAL—NUCHAL RIDGE	PERITONEAL COLOR	SEX	TYPE	SEQUENTIAL NUMBER
H030	10	4	-	188	163	-	109	64	13	58	12	6	-	14	12	25	-	-	14	7	19	-	30	11	24	MAJOR	NONE	NONE	R	R	R	R	R	R	SEP	SEP	-	M	FASCIATUS	575
H030	10	5	-	-	233	-	159	69	20	82	19	8	-	23	13	31	-	-	13	7	19	-	29	10	-	NONE	NONE	NONE	R	R	R	R	R	R	FUS	FUS	-	F	FASCIATUS	576
H030	10	6	-	249	220	-	147	72	20	74	17	8	-	24	13	27	-	-	14	7	19	-	29	10	-	NONE	NONE	NONE	R	R	R	R	R	R	FUS	FUS	-	M	FASCIATUS	577
H030	10	8	-	261	223	-	152	74	20	84	18	8	-	24	13	28	-	-	14	7	19	-	29	10	-	NONE	NONE	NONE	R	R	R	R	R	R	FUS	FUS	-	M	FASCIATUS	578
H030	10	9	-	254	216	-	153	74	20	84	18	8	-	24	13	28	-	-	14	7	19	-	29	10	-	MAJOR	NONE	NONE	R	R	R	R	R	R	SEP	SEP	-	F	FASCIATUS	579
H030	10	10	-	318	273	-	184	100	26	100	21	11	-	29	16	36	-	-	13	7	18	-	29	10	25	NONE	NONE	NONE	R	R	R	R	R	R	FUS	FUS	-	F	FASCIATUS	580
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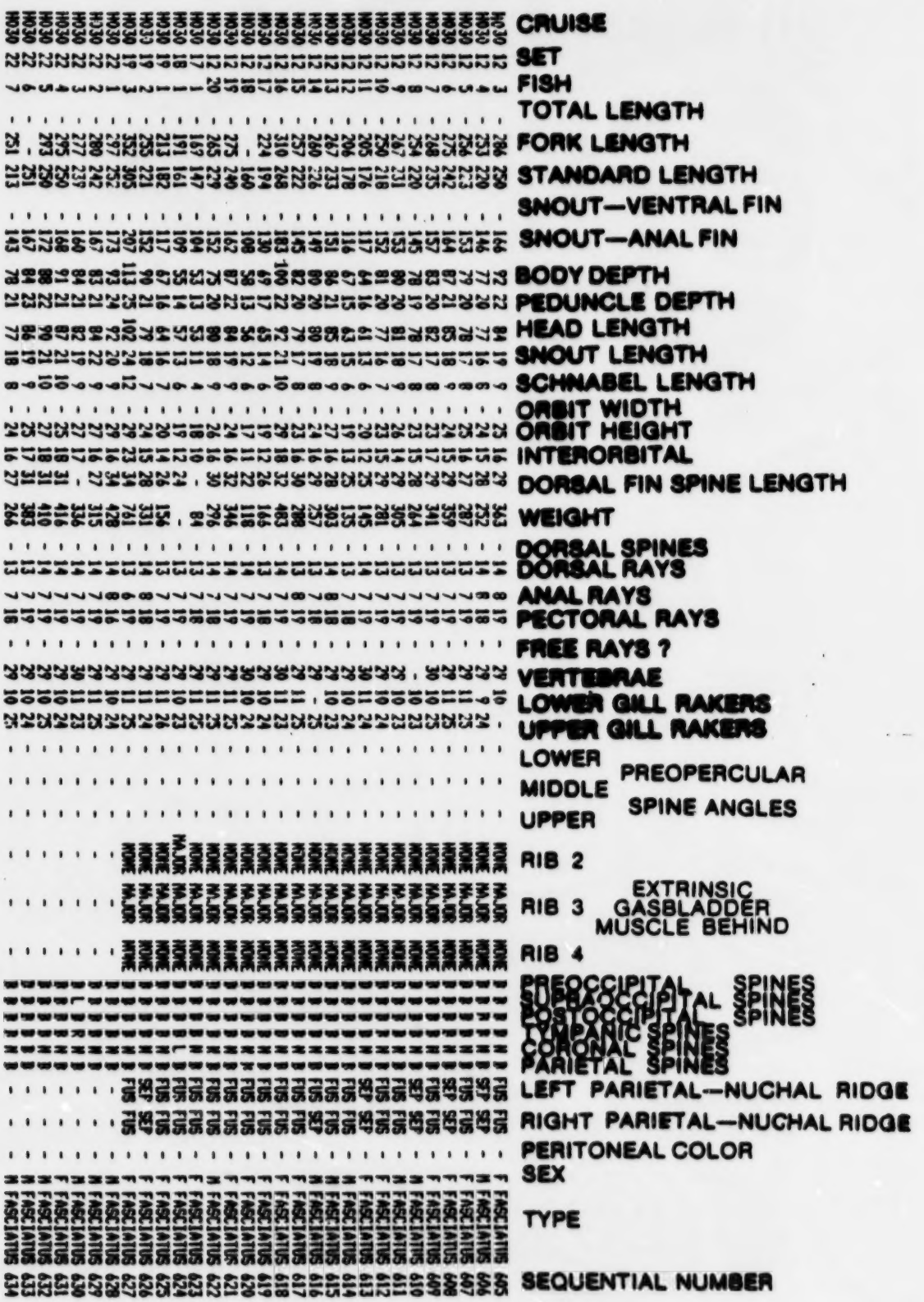
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HEAD LENGTH
SNOUT LENGTH
SCHNABEL LENGTH
ORBIT WIDTH
ORBIT HEIGHT
INTERORBITAL
DORSAL FIN SPINE LENGTH
WEIGHT
DORSAL SPINES
DORSAL RAYS
ANAL RAYS
PECTORAL RAYS
FREE RAYS ?
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LOWER GILL RAKERS
UPPER GILL RAKERS
LOWER
MIDDLE
UPPER
PREOPERCULAR SPINE ANGLES
RIB 2
RIB 3
RIB 4
EXTRINSIC GASBLADDER MUSCLE BEHIND
PREOCCIPITAL SPINES
SUPRAOCCIPITAL SPINES
POSTOCCIPITAL SPINES
TYMPANIC SPINES
CORONAL SPINES
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RIGHT PARIETAL--NUCHAL RIDGE
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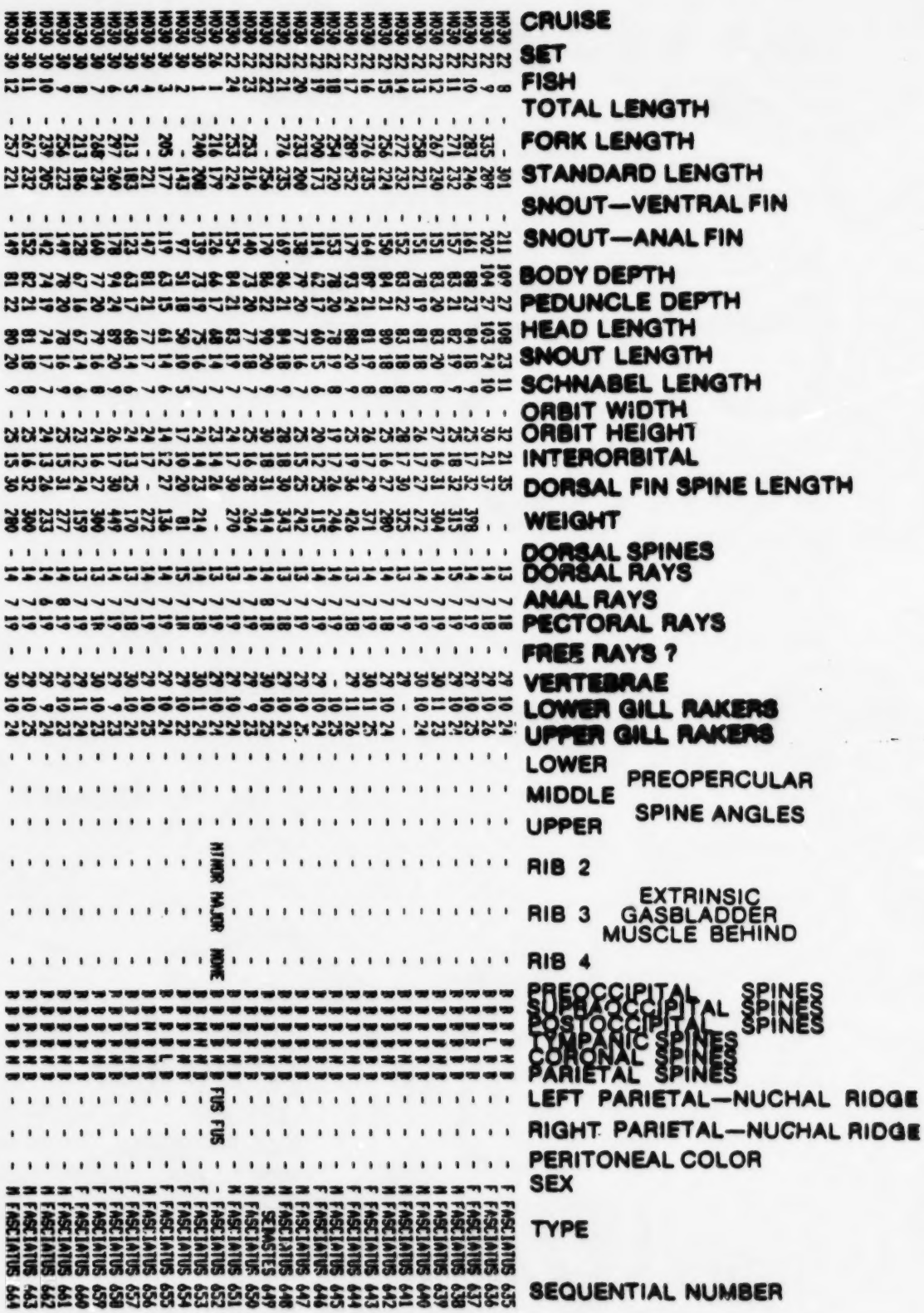
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SNOUT LENGTH
SCHNABEL LENGTH
ORBIT WIDTH
ORBIT HEIGHT
INTERORBITAL
DORSAL FIN SPINE LENGTH
WEIGHT
DORSAL SPINES
DORSAL RAYS
ANAL RAYS
PECTORAL RAYS
FREE RAYS ?
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UPPER GILL RAKERS
LOWER
MIDDLE
UPPER
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RIB 3
RIB 4
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MAJOR
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PREOCCIPITAL SPINES
SUPRAOCCIPITAL SPINES
POSTOCCIPITAL SPINES
TYMPANIC SPINES
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PARIETAL SPINES
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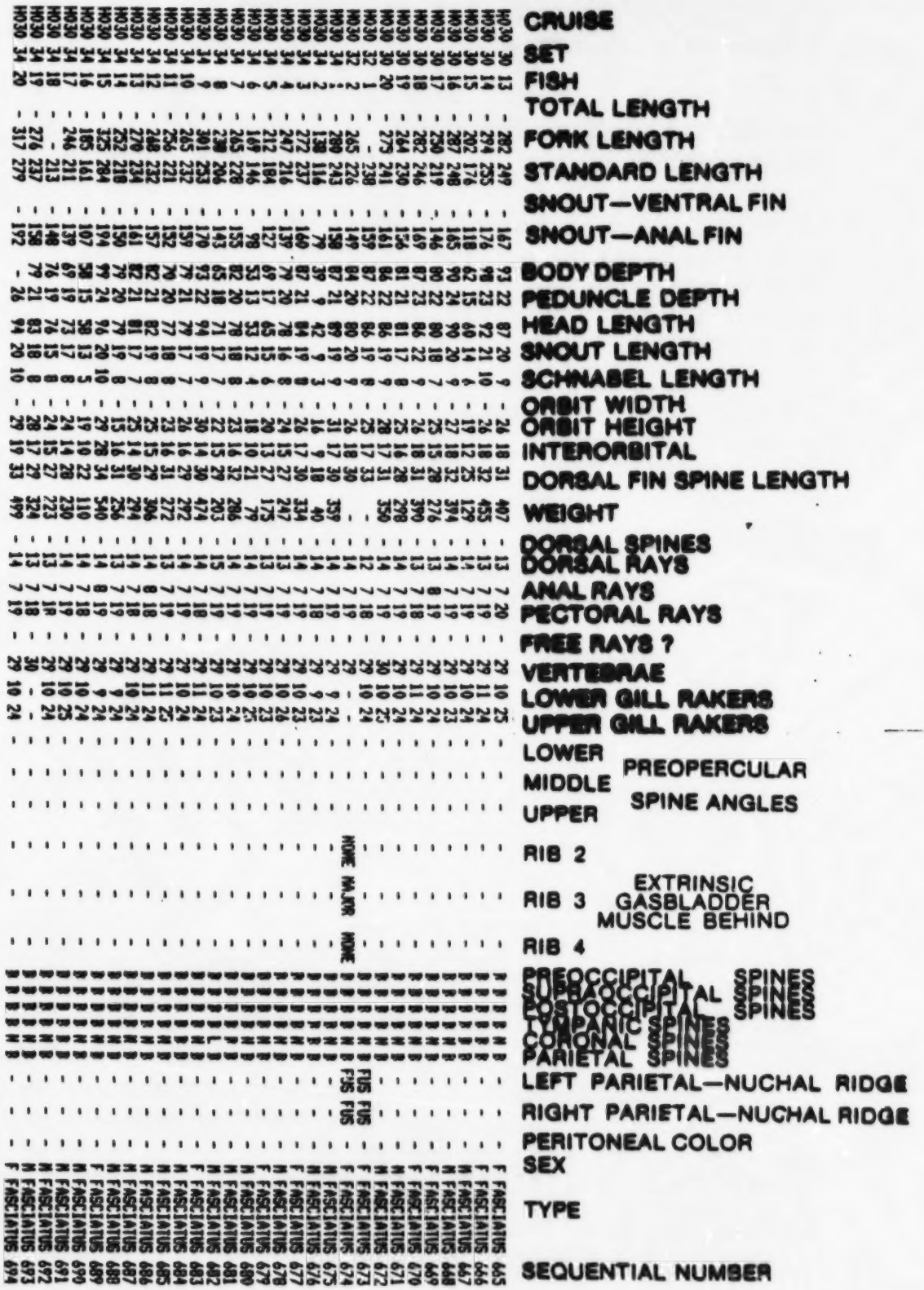
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ORBIT WIDTH
ORBIT HEIGHT
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PECTORAL RAYS
FREE RAYS ?
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UPPER GILL RAKERS
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UPPER
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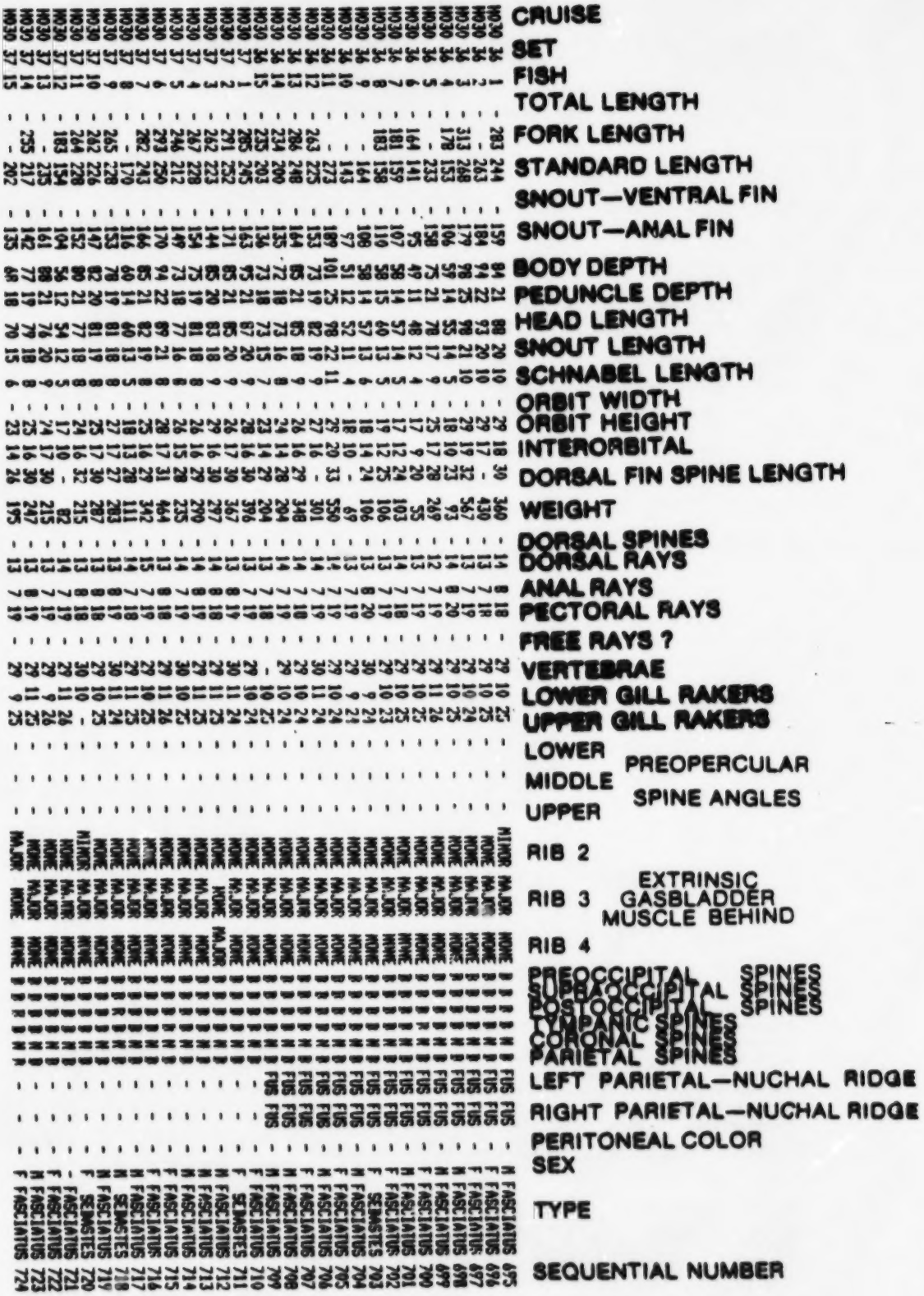
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SNOUT—ANAL FIN
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SNOUT LENGTH
SCHNABEL LENGTH
ORBIT WIDTH
ORBIT HEIGHT
INTERORBITAL
DORSAL FIN SPINE LENGTH
WEIGHT
DORSAL SPINES
DORSAL RAYS
ANAL RAYS
PECTORAL RAYS
FREE RAYS ?
VERTEBRAE
LOWER GILL RAKERS
UPPER GILL RAKERS
LOWER
MIDDLE
UPPER
PREOPERCULAR SPINE ANGLES
RIB 2
RIB 3
EXTRINSIC GASBLADDER MUSCLE BEHIND
RIB 4
PREOCCIPITAL SPINES
SUPRAOCCIPITAL SPINES
POSTOCCIPITAL SPINES
TYMPANIC SPINES
CORONAL SPINES
PARIETAL SPINES
LEFT PARIETAL—NUCHAL RIDGE
RIGHT PARIETAL—NUCHAL RIDGE
PERITONEAL COLOR
SEX
TYPE
SEQUENTIAL NUMBER

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H037	CRUISE
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1	FISH
272	TOTAL LENGTH
230	FORK LENGTH
211	STANDARD LENGTH
-	SNOUT—VENTRAL FIN
158	SNOUT—ANAL FIN
87	BODY DEPTH
20	PEDUNCLE DEPTH
82	HEAD LENGTH
21	SNOUT LENGTH
9	SCHNABEL LENGTH
-	ORBIT WIDTH
25	ORBIT HEIGHT
16	INTERORBITAL
30	DORSAL FIN SPINE LENGTH
324	WEIGHT
-	DORSAL SPINES
13	DORSAL RAYS
7	ANAL RAYS
15	PECTORAL RAYS
-	FREE RAYS ?
29	VERTEBRAE
10	LOWER GILL RAKERS
23	UPPER GILL RAKERS
-	LOWER PREOPERCULAR
-	MIDDLE PREOPERCULAR
-	UPPER PREOPERCULAR SPINE ANGLES
MINOR	RIB 2
MINOR	RIB 3 EXTRINSIC GASBLADDER MUSCLE BEHIND
NONE	RIB 4
P	PREOCCIPITAL SPINES
P	SUPRAOCCIPITAL SPINES
P	POSTOCCIPITAL SPINES
P	TYMPANIC SPINES
L	CORONAL SPINES
P	PARIETAL SPINES
FUS	LEFT PARIETAL—NUCHAL RIDGE
FUS	RIGHT PARIETAL—NUCHAL RIDGE
-	PERITONEAL COLOR
M	SEX
FASCIATUS	TYPE
797	SEQUENTIAL NUMBER

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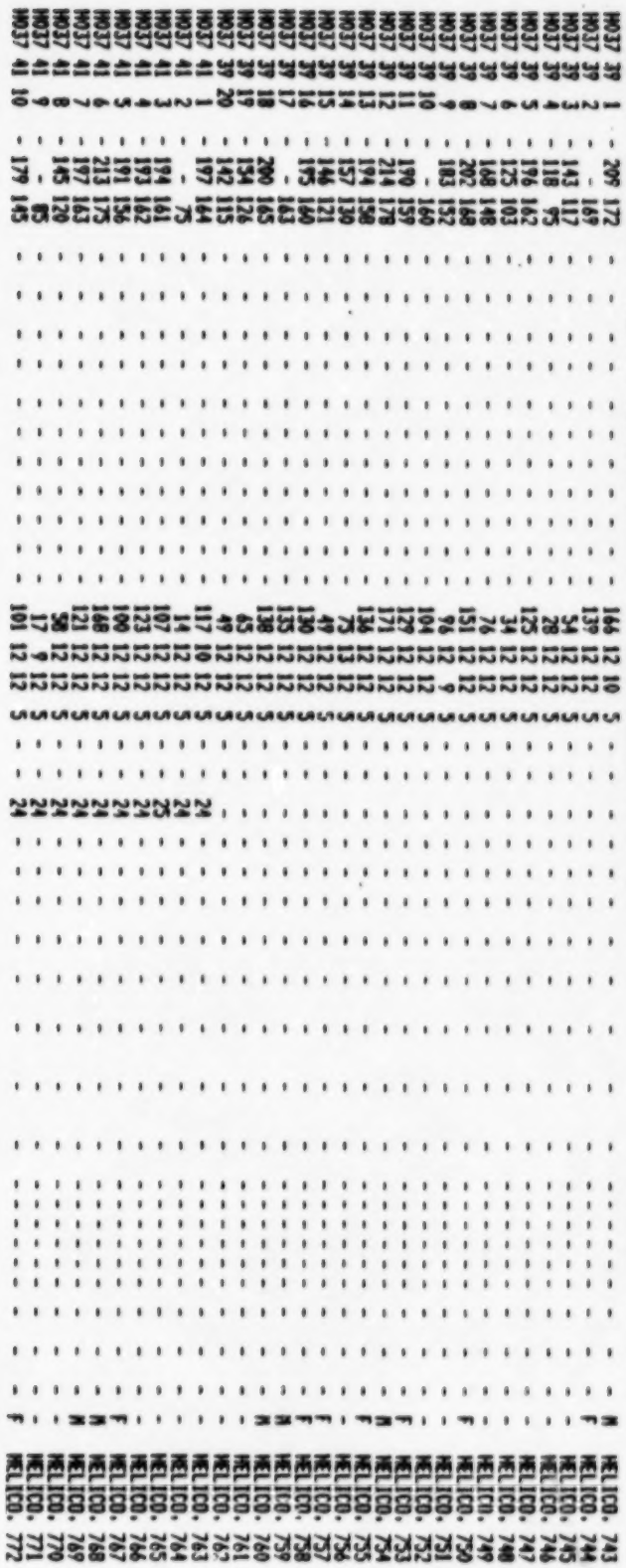
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BODY DEPTH
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HEAD LENGTH
SNOUT LENGTH
SCHNABEL LENGTH
ORBIT WIDTH
ORBIT HEIGHT
INTERORBITAL
DORSAL FIN SPINE LENGTH
WEIGHT
DORSAL SPINES
DORSAL RAYS
ANAL RAYS
PECTORAL RAYS
FREE RAYS ?
VERTEBRAE
LOWER GILL RAKERS
UPPER GILL RAKERS
LOWER
MIDDLE
UPPER
PREOPERCULAR SPINE ANGLES
RIB 2
RIB 3
EXTRINSIC GASBLADDER MUSCLE BEHIND
RIB 4
PREOCCIPITAL SPINES
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TYMPANIC SPINES
CORONAL SPINES
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PERITONEAL COLOR
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TYPE
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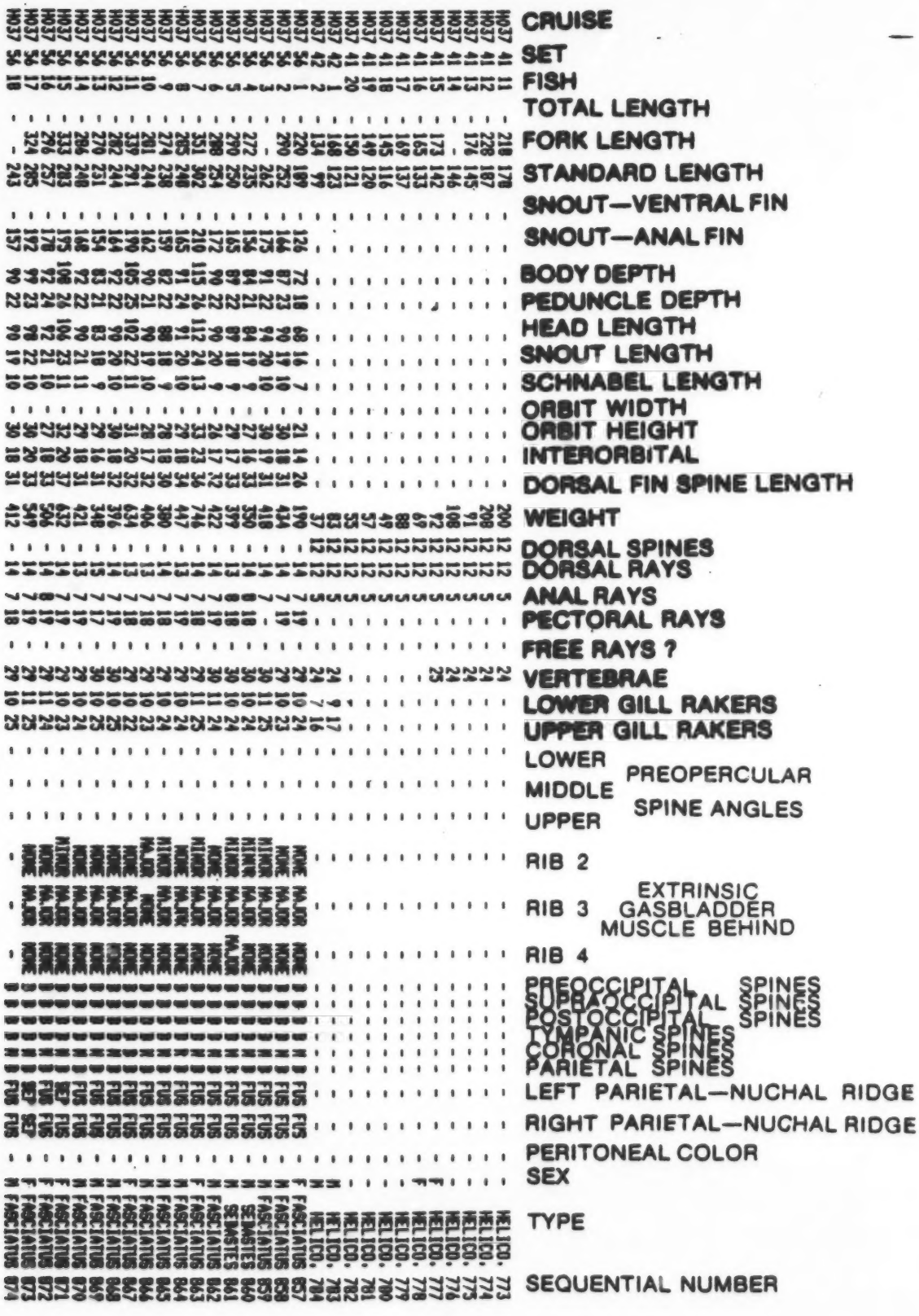
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ORBIT HEIGHT
INTERORBITAL
DORSAL FIN SPINE LENGTH
WEIGHT
DORSAL SPINES
DORSAL RAYS
ANAL RAYS
PECTORAL RAYS
FREE RAYS ?
VERTEBRAE
LOWER GILL RAKERS
UPPER GILL RAKERS
LOWER
MIDDLE
UPPER
PREOPERCULAR SPINE ANGLES
RIB 2
RIB 3
RIB 4
EXTRINSIC GASBLADDER MUSCLE BEHIND
PREOCCIPITAL SPINES
SUPRAOCCIPITAL SPINES
POSTOCCIPITAL SPINES
TYMPANIC SPINES
CORONAL SPINES
PARIETAL SPINES
LEFT PARIETAL—NUCHAL RIDGE
RIGHT PARIETAL—NUCHAL RIDGE
PERITONEAL COLOR
SEX
TYPE
SEQUENTIAL NUMBER

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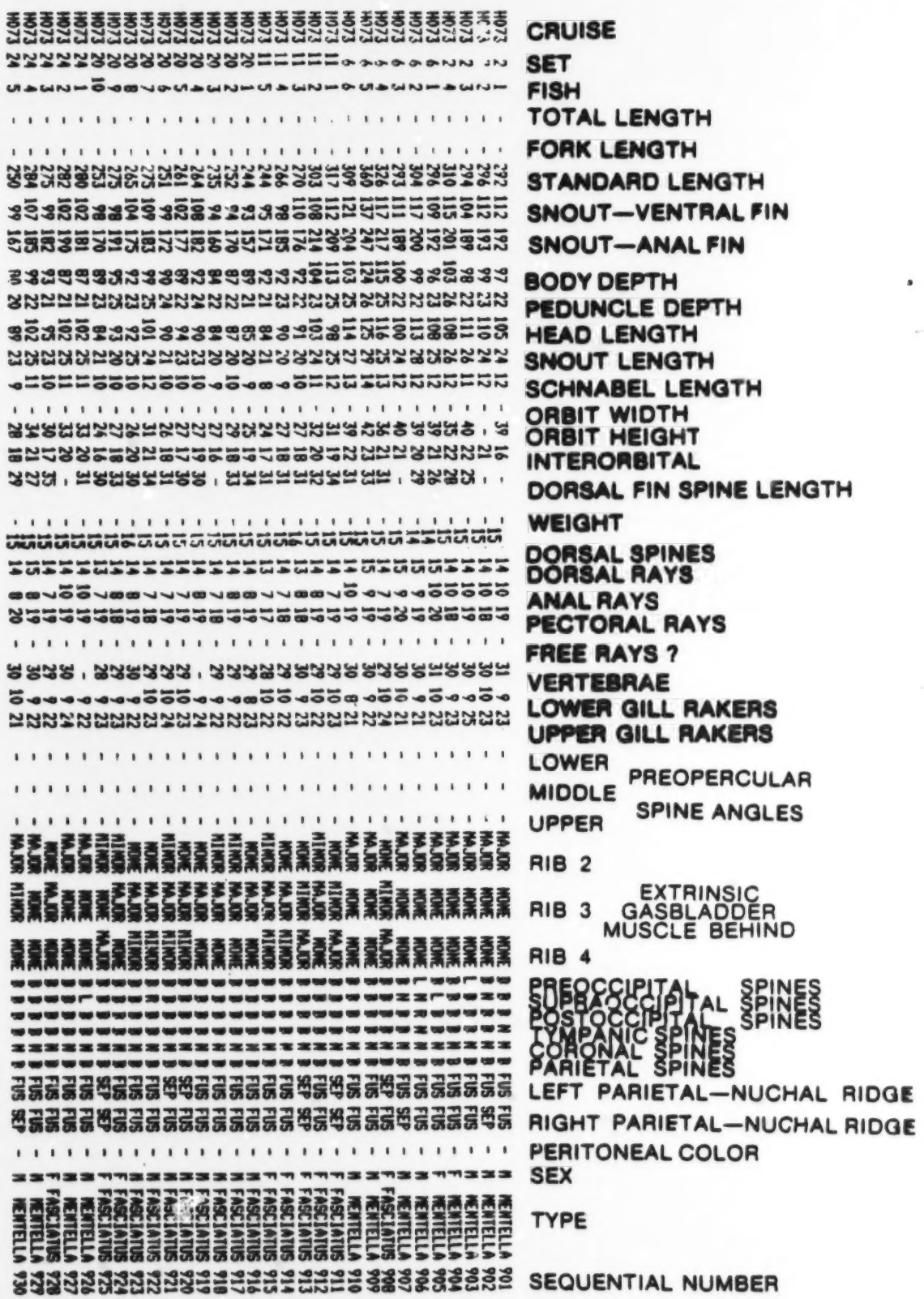
APPENDIX 2

This appendix lists the data for the 30 fish of the electrophoresis collection using the same format as in Appendix 1.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SNOUT LENGTH
SCHNABEL LENGTH
ORBIT WIDTH
ORBIT HEIGHT
INTERORBITAL
DORSAL FIN SPINE LENGTH
WEIGHT
DORSAL SPINES
DORSAL RAYS
ANAL RAYS
PECTORAL RAYS
FREE RAYS ?
VERTEBRAE
LOWER GILL RAKERS
UPPER GILL RAKERS
LOWER
MIDDLE
UPPER
PREOPERCULAR SPINE ANGLES
RIB 2
RIB 3
RIB 4
EXTRINSIC GASBLADDER MUSCLE BEHIND
PREOCCIPITAL SPINES
SUPRAOCCIPITAL SPINES
POSTOCCIPITAL SPINES
TYMPANIC SPINES
CORONAL SPINES
PARIETAL SPINES
LEFT PARIETAL—NUCHAL RIDGE
RIGHT PARIETAL—NUCHAL RIDGE
PERITONEAL COLOR
SEX
TYPE
SEQUENTIAL NUMBER